Mission Services Customer Forum

July 17, 2003
Goddard Space Flight Center
Greenbelt Maryland

Agenda

- 1:00 Opening Remarks — Mr. A. Levine
  - Open Action Items
- 1:10 Open Floor (Customer Concerns/Issues) — Mr. A. Levine
  - IT Security — Mr. C. Emerson
- 1:30 Featured Topics
  - Space Network Access System (SNAS) — Mr. J. Stevens
  - TDRSS Continuation/TCA — Mr. J. Walker
- 2:00 System Status Update
  - Ground Network — Mr. R. Clason
  - Space Network — Mr. K. Tasaki
  - FDF — Ms. D. Sadof
  - DSMC — Mr. B. Hudgins

Agenda (cont'd)

- 3:00 Enterprise Updates
  - Earth Sciences — Mr. E. Macie
  - Space Sciences — Mr. R. Mahmot
  - Human Space Flight — Mr. J. Bangerter
- 3:45 Loading/Resources — Mr. A. Levine
- 4:00 Closing Remarks — Mr. A. Levine

Opening Remarks

Allen Levine
Service Planning Manager Customer Commitment Office/Code 451
NASA/Goddard Space Flight Center

Action Items

MSCF Open Action Items

Action Item	Assignee(s)	Action	Status	Progress
MSCF-11-15-04	All Projects	Ensure issues are raised sufficiently early to ensure that adequate time is available to address mission concerns (i.e., compatibility testing, requirements, etc.) and thus possibly avoid a need to form TIGER teams.	Open	This action item is for information only; the activity is ongoing.
MSCF-11-15-08	Service Providers	Provide a briefing for the next MSCF meeting.	Open	Completion of this action item is pending release of NASA RFPs related to the CSOC recompete and possibly commercialization. The network service providers have expressed interest in presenting at the MSCF.

MSCF Open Action Items (cont.)

Action Item	Assignee(s)	Action	Status	Progress
MSCF-02-21-02	NISN (S. Douglas), SN (K. Tasaki), & CSOC Engineering (R. Nguyen)	Meet and determine the current status of the 4800-bit block versus IP problem, and how to move forward toward a solution.	Open	1. Set up a test lab to demonstrate a new NASA wide data service based on CCSDS SLE. • CSOC Houston under a SODA task procured and installed an interim SLE provider system at the Wallops Telemetry Development Microwave System Laboratory (Bldg E134) with following capabilities: • CCSDS SLE data services based on Avtec Telemetry Command Processor - Unframed Bit Stream data service over SLE based on Global Science and Technology R&D Air Force Satellite Control Network (AFSCN) project - Equipment was not connected to RF equipment or 5.4 Meter Antenna. - All 7 tests ran successfully at rates under 500Kbs. However, anomalies were encountered when downlink throughput rose above 500 Kbs. • They completed FY02 SLE provider and user data transfer testing using an interim SLE implementation at Wallops and Houston. 2. Establish the infrastructure required for interoperability testing between NASA ground station at Wallops and the Air Force Satellite Control Network (AFSCN). • The effort to establish an an infrastructure required for interoperability testing between NASA ground station at Wallops and the Air Force Satellite Control Network (AFSCN) is on-going. 3. CSOC/GSFC engineering is studying a possibility of transitioning front-end for ACE mission from Nascom Block interface to SLE. • CSOC/GSFC engineering is studying the impact for transitioning front-end equipment for Code S missions from Nascom Block interface to SLE. CSOC is coordinating with GMSEC to set up a SLE Service User in GMSEC lab for testing with SLE Service Provider at WFF. 4. Pending on funding availability in FY03, establish the infrastructure required for interoperability testing between NASA ground station at WSC and the Air Force Satellite Control Network (AFSCN). • Successful demonstration of new data service will promote the phasing out of Nascom block. Code 450 is having discussion leading to a position on new data service that would be used to phase out Nascom Block interface.

MSCF Open Action Items (cont.)

Action Item	Assignee(s)	Action	Status	Progress
MSCF-02-21-04	DSMC (C. Barclay) & Network Service Manager (A. Levine)	Discuss and recommend a process to address Interference Management priorities.	Open	Interference analysis is in progress. 2nd round of analysis has begun
MSCF-02-21-05	SN (K. Tasaki & R. Schonbachler)	Determine a timeframe for final conversion to the new TDRS naming convention for the NCC/DSMC scheduling system.	Open	In process. Potentially impacted customers are being contacted to determine their current status regarding conversion.

Open Floor

Online Resources

- Mission Services Program (Code 450) Website - http://msp.gsfc.nasa.gov
  - Code 450 website containing links to SN project, GN Project, TDRS Project and Customer Commitment Office websites
- Space Network Online Information Center - http://msp.gsfc.nasa.gov/tdrss/
  - Comprehensive website containing detailed information regarding the Space Network, related projects and activities
  - Links to the Space Network Users Guide
  - Online Link Budget Calculators
- Code 450 Online Document Library accessed through the GSFC Directives Management System (GDMS) (http://gdms.gsfc.nasa.gov)
  - Navigate to the Code 450 library of documents via the Centralized Configuration Management System (CCMS) link.

Information Technology Security

Curtis Emerson
Computer Security Official
GSFC, Code 450

IT Security

- New Code 400 Directorate Computer Security Engineer is Curtis Schwartz
  - Coordinates directly with Code 400 Directorate Computer Security Official, Cecilia Czarnecki
  - Provides in-depth IT Security guidance to Code 400 System Administrators regarding state-of-the-art Network Security countermeasures and interpretation of NASA IT Security requirements
  - Conducts IT Security audits and serves on design reviews at the request of Projects or Programs

IT Security

- Login Warning Banner required on all NASA owned or funded systems:

  This U.S. Government resource is for authorized use only. If not authorized to access this resource, disconnect now. Unauthorized access to, or use of this resource may subject you to disciplinary action or criminal prosecution. By accessing and using this resource, you are consenting to monitoring, keystroke recording, or auditing.

- Register Public WWW servers

  www.WebRegistry.gsfc.nasa.gov for WWW servers on NASA.GOV address

IT Security

- Security training
  - SOLAR Basic IT and Manager courses
  - SOLAR Security Education and Awareness to be completed by November
  - System Administrator certification

- Security Alerts
  - Inappropriate use - sharing of copyrighted material via Kazaa and Grokster
  - e-mail that appears to be from Microsoft Support or support@yahoo.com
  - SoBig, Yaha worm; Zasi, Sniff-Systrim trojan horse

IT Security Points of Contact

Code 450 Contacts	Code 400 and Center-wide
Curtis Emerson Computer Security Official for Code 450 Code 452 / Bld 12 Room E213 Voice 301-286-7670 / FAX 301-286-0328 Email: Curtis.M.Emerson@nasa.gov	Cecilia Allen Czarnecki Directorate Computer Security Official NASA GSFC Code 403 Voice - 301-286-7398, Pager 888-232-3292 Cecilia.A.Czarnecki@nasa.gov
Joe Stevens Alternate Computer Security Official for Code 450 Code 450/566 / Bld 12 Room E215 Voice (301) 286-1557 / Fax (301) 286-0328 Email: Edwin.J.Stevens@nasa.gov	Henry J. Middleton Center Information Technology (IT) Security Manager Code 291/Bldg 12/Room E-120 Voice: 301-286-2486/Fax: 301-286-1723 Pager: 877-461-0567
Jul Scarborough CSOC GSFC Site Security Coordinator Code 450.C / Goddard Corporate Park voice 301-805-3209 / FAX 301-805-3025 email: Julian.S.Scarborough.1@gsfc.nasa.gov	Patricia A. Coffen/Deputy Information (IT) Security Manager Code 291 Building 12 Room E120 Voice: (301) 286-6051 / Fax: (301) 286-1723 Pager: 877-459-5176
Security Operations Center at 301-286-8661 If Center ITS personnel are unavailable, contact NASIRC directly. 1-800-7NASIRC (800-762-7472) FAX: 301-286-7483	

Featured Topics

Space Network Access System (SNAS)

E.J. Stevens

SNAS Overview

- SNAS is being developed as a single customer interface for performing SN customer scheduling and real-time service monitoring and control

- SNAS will consolidate the functionalities of the following SN systems into a single system:
  - User Planning System (UPS)
  - SN Web Services Interface (SWSI)

SNAS Capabilities

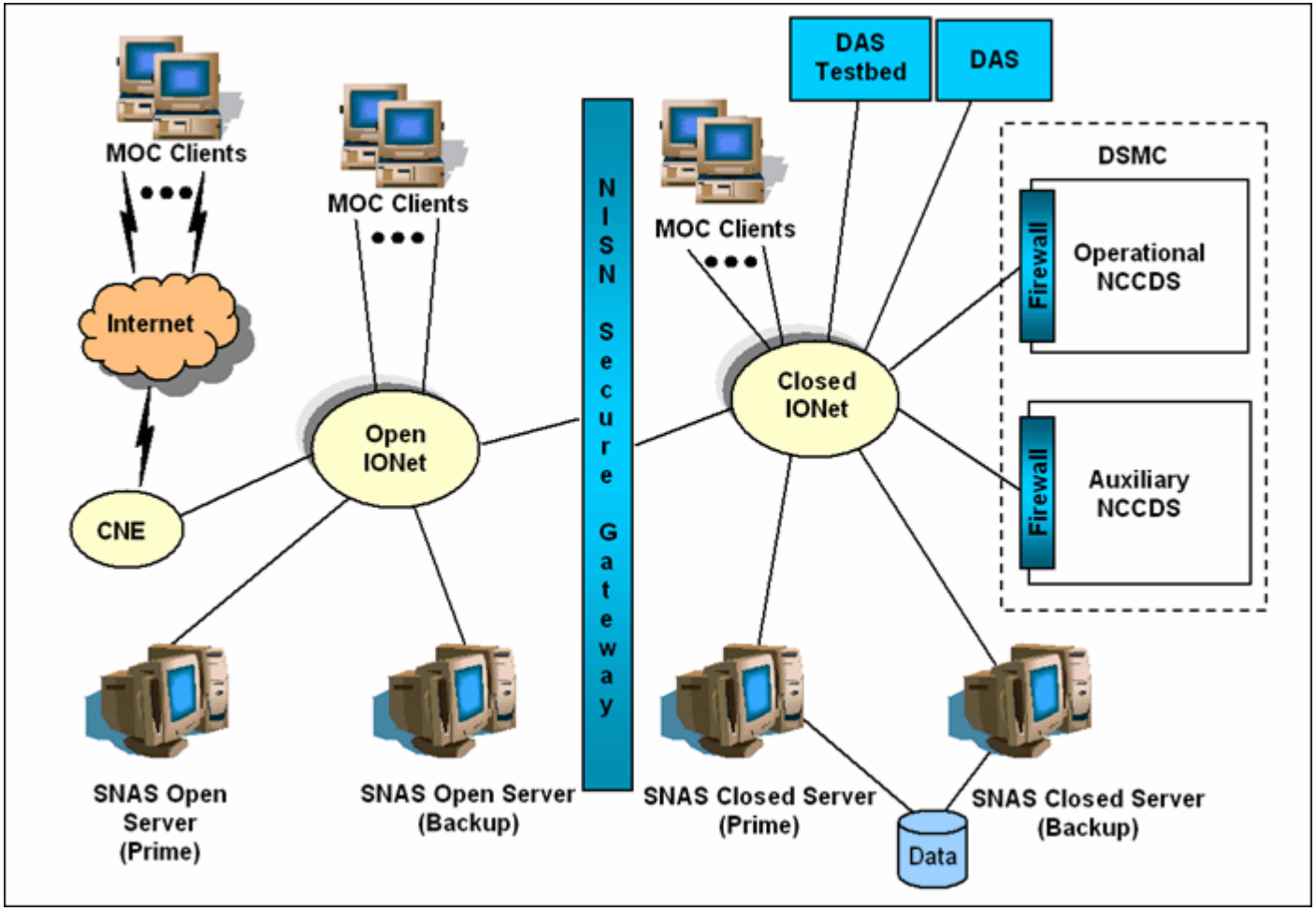
- Provides a networks-based (server-client relationship) customer interface for performing SN scheduling and real-time control and monitoring

- Supports customers who schedule SN services through both the Network Control Center Data System (NCCDS) and the Demand Access System (DAS)

- Accessible from the Internet and the NISN Open and Closed IONet

- Provides for easy system setup and workstation independence for the SN customer (the SNAS client software may be run on any type of personal computer or workstation that can run Sun Microsystems Java Virtual Machine)

SNAS Reference Architecture



Architecture Descriptions

- Client:
  - Client software will reside on SN Customer MOC workstation or PC
  - Provide access to the SN via the Open or Closed SNAS Servers
- Servers:
  - Act as proxies to route requests from the client to the NCCDS and/or the DAS, and return responses to the client
  - Establish and maintain all required Transmission Control Protocol (TCP) connections
- Database:
  - Operate on the Closed IONet side of the NISN Secure Gateway
  - Hold static data, semi-static data, and dynamically updated data
  - SNAS customers will be granted access privileges depending upon their roles

SNAS Status

- Completed the SNAS System Requirements Review (SRR) on July 8, 2003
- Currently updating SNAS requirements based on the SRR
- Draft documents are on the SNAS Web Site (http://snas.gsfc.nasa.gov)
- SNAS implementation to begin in January 2004
- Projected SNAS Operational Readiness date is December 2005

TDRSS Continuation and Transformational Communications Architectures

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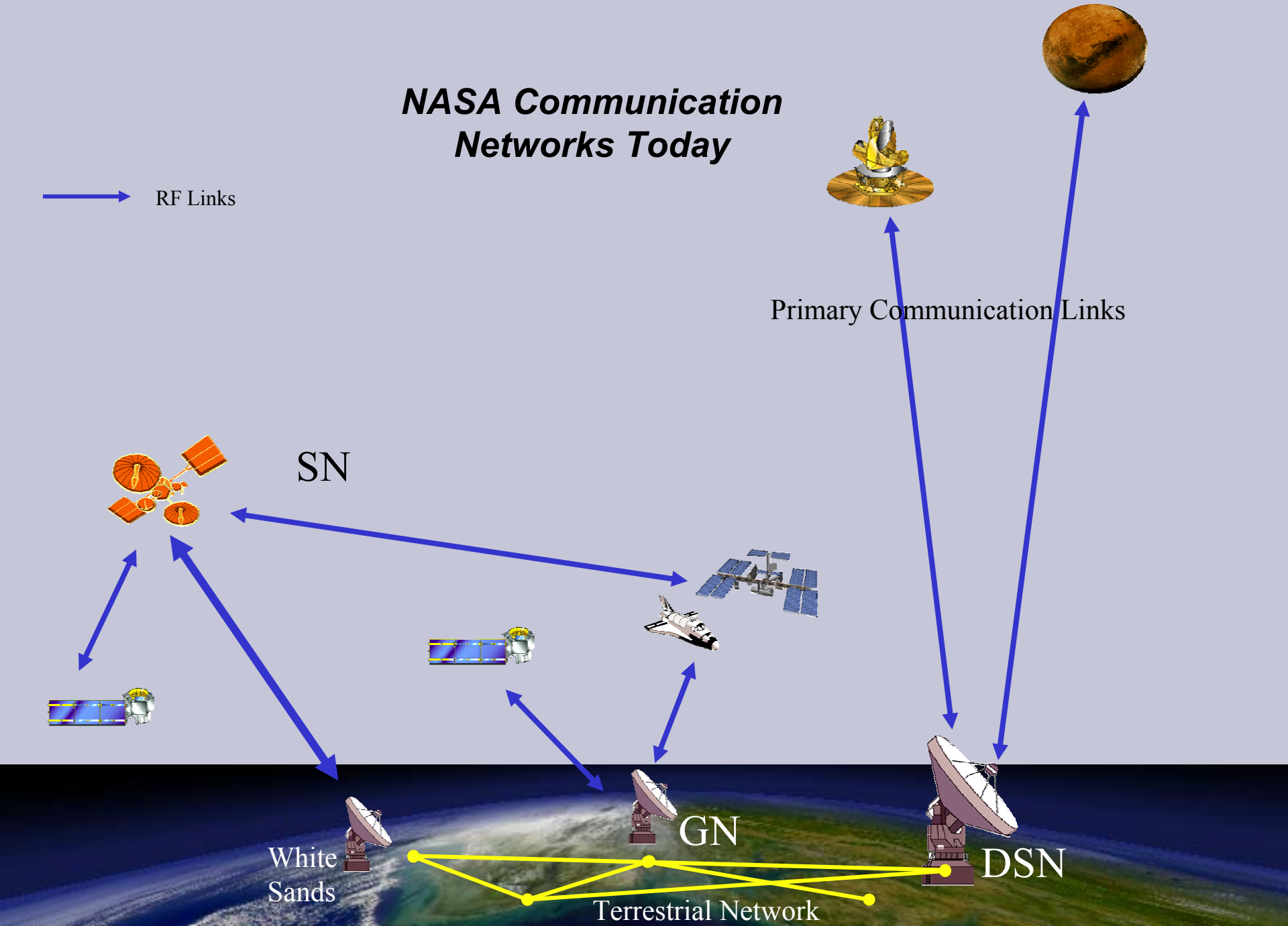
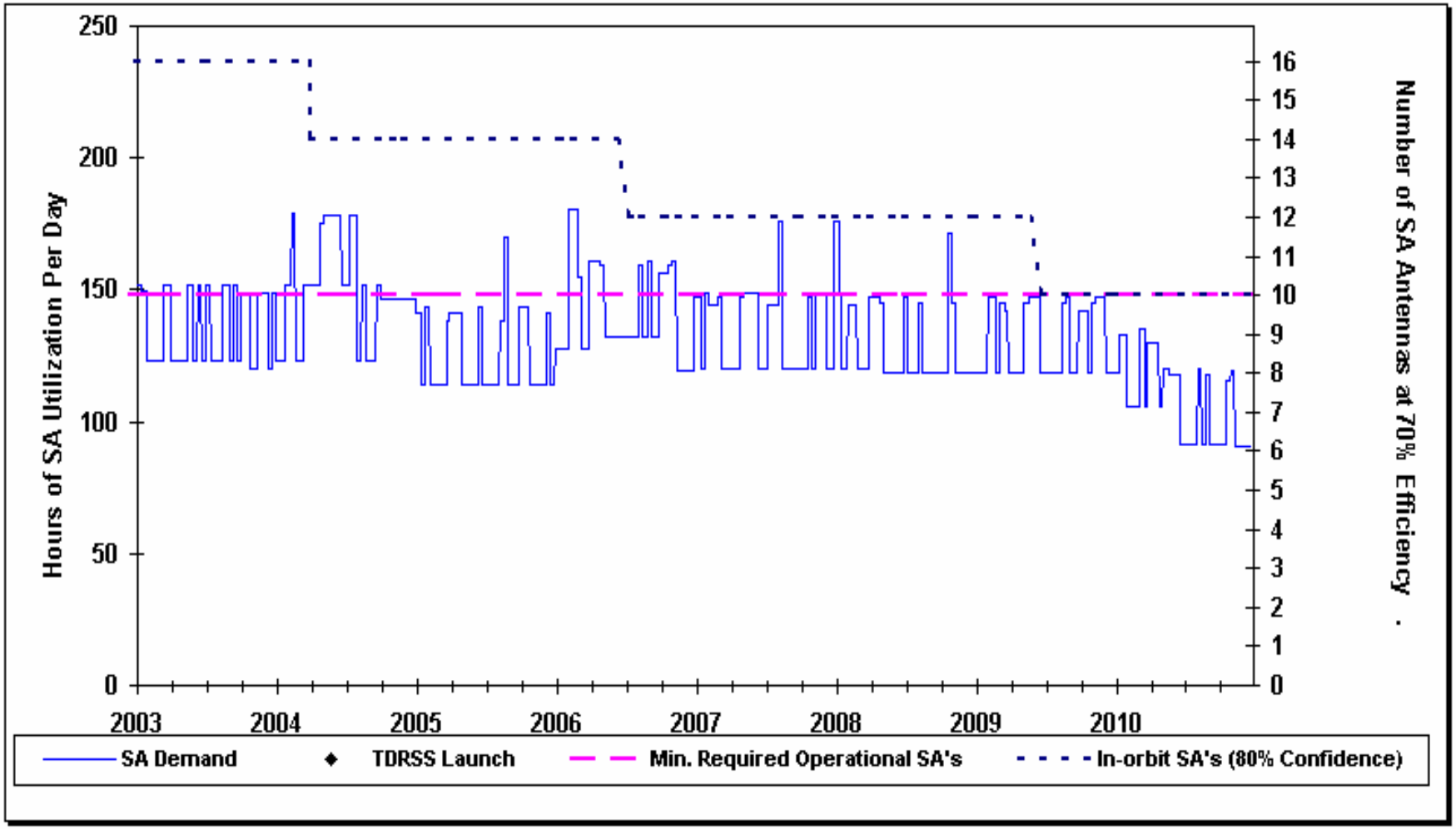
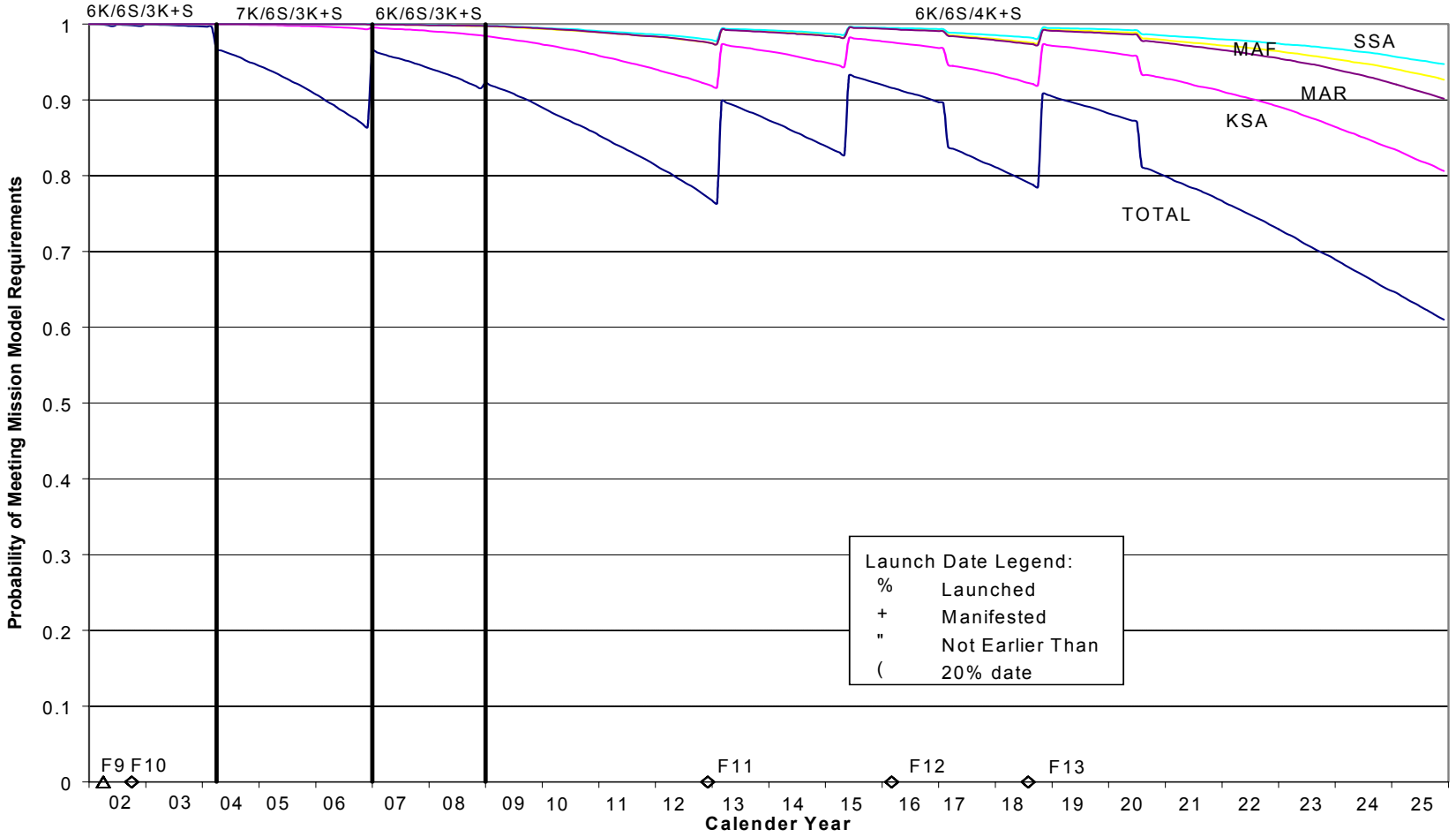

NASA Communication
Networks Today
RF Links
Primary Communication Links
SN
GN
DSN
White
Sands
Terrestrial Network

SA Demand Versus TDRSS On-Orbit Capacity



Note: Minimum required operational SA's reflects 4 SA's in East Node, 4 SA's in West Node, 2 SA's in ZOE to meet the projected demand while providing needed operational balance.

TDRSS Reliability Model



Graph shows probability that TDRS constellation will be able to meet specified user requirements for each type of service.

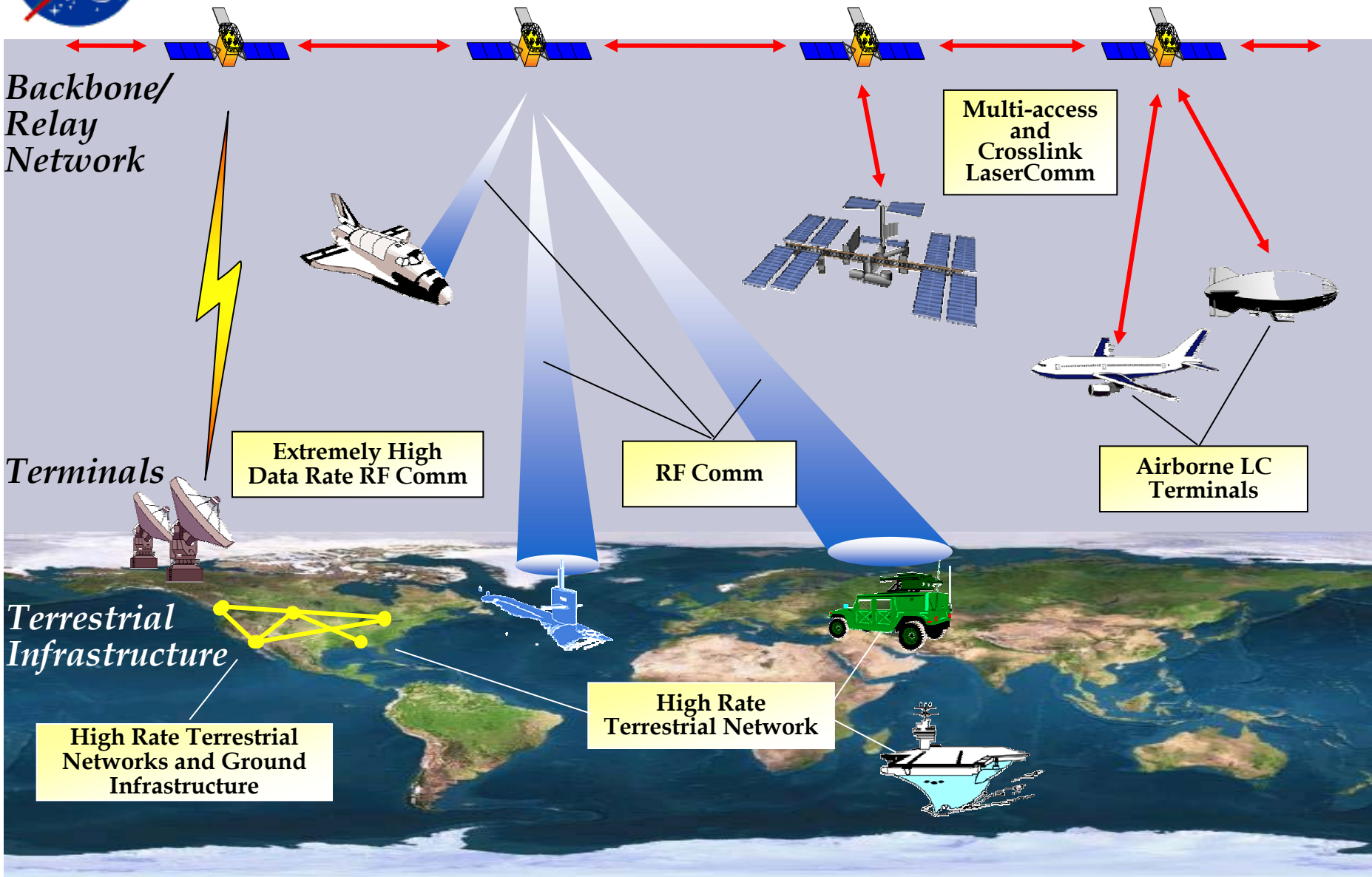
Top Level Overview

- **Provide global coverage up to Medium Earth Orbit (MEO) altitudes for Earth satellite and exoatmospheric customers in the 2010 - 2020 timeframe**
- **Provide S-band, Ku-band, and Ka-band RF communications capability with customers**
- **Provide ability to support launch vehicles in S-band**
- **Provide Ka-band return data rates up to 1200 Mbps for each Ka-band channel**
- **Allow Ground-based Beam Forming for Multiple Access (MA) S-band communications system**
- **Provide Demand Access capability through the MA system**
- **Enable customer tracking in S-band with 100 meter positioning accuracy**

How NASA Can Achieve Transformation

- **Integrate the needs of many organizations in need of space based telecommunications**
  - Provide cost efficient solutions to user needs
  - Allows for projected growth by 2020
- **A Federal architecture that eliminates redundant systems and overlapping service capacity**

The United States Transformational Communications Architecture

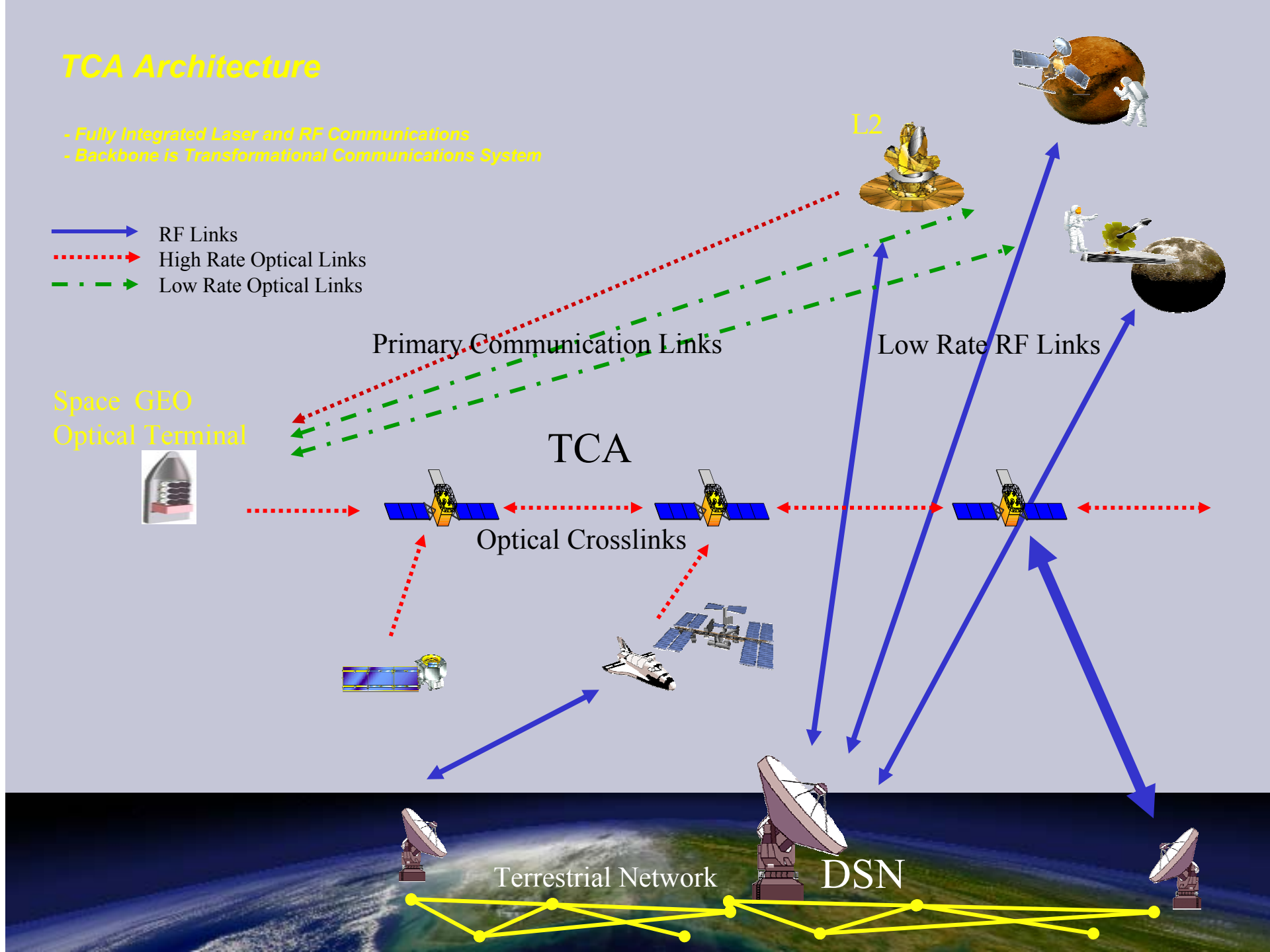


NASA TCA Vision

- In the TCA era, NASA envisions:
  - Relay services for NASA missions are available on the TCA backbone
  - All relay services are available to and shared by all agencies (i.e., any TCA user)
  - The backbone and/or services are controlled or operated by a joint operations organization representing all stakeholders
  - NASA and all other relay customers request services from TCA at a centralized location and are granted or denied services based on established mission priority and service availability
  - Mission priorities are established by a multi-agency and stakeholder steering group
  - TCA provides information exchange to NASA customers regarding status of service requests, status of ongoing services, anomaly resolution, periodic metrics reporting, etc.

TCA Architecture

- Fully Integrated Laser and RF Communications
- Backbone is Transformational Communications System



TCA Summary

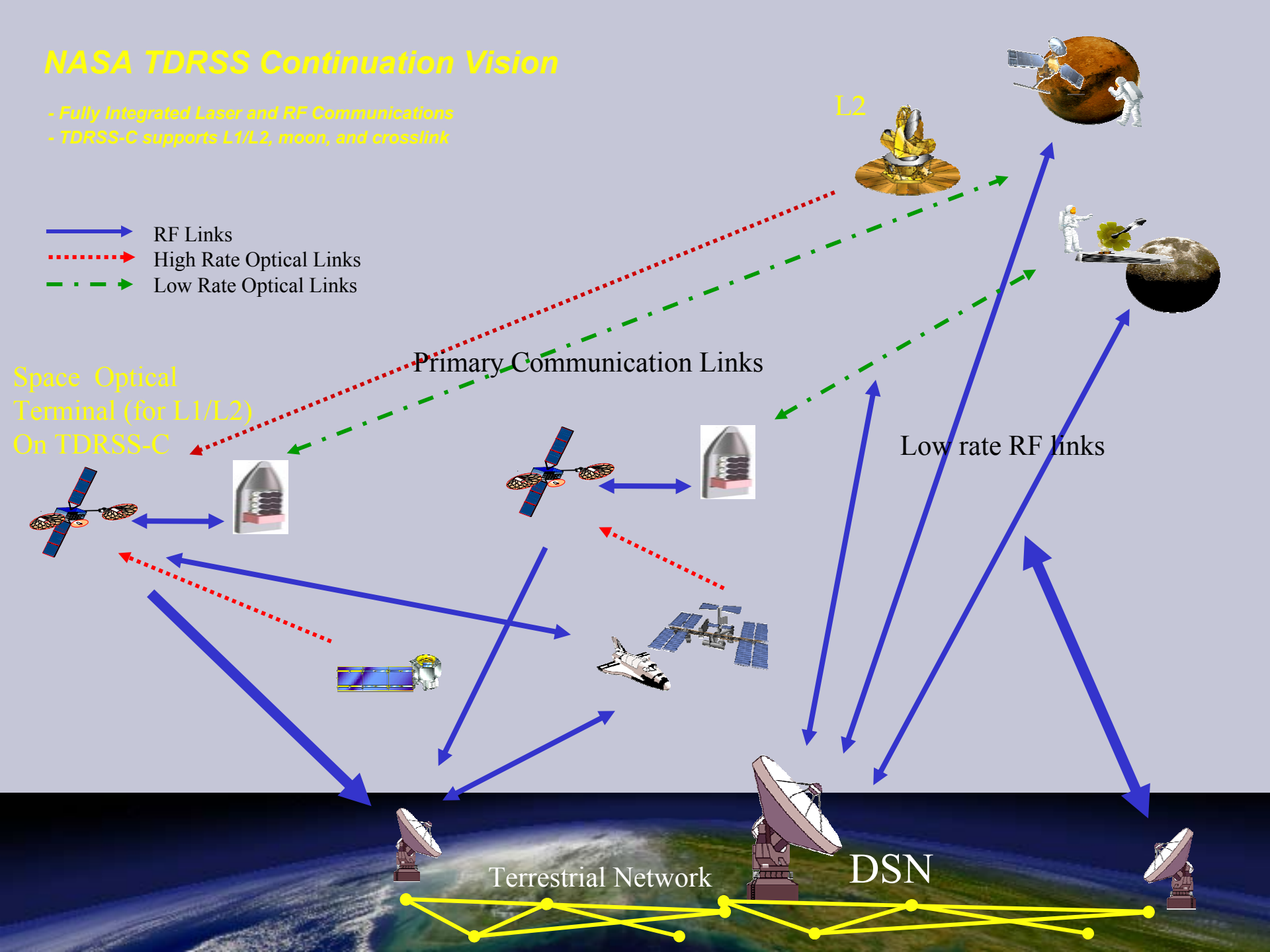
- **TCA offers NASA and others an opportunity to step back from operations and infrastructure requirements attendant to providing Tracking and Data Acquisition services**
- **Redirect operations and infrastructure in favor of expanding science and technology interests**

NASA TDRSS Continuation Vision

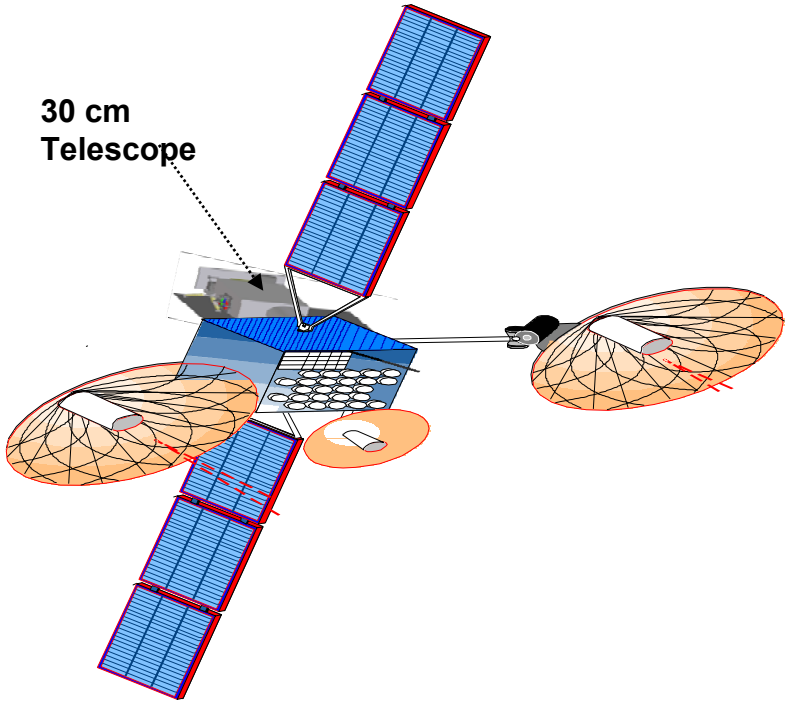
- In the 2010 - 2020 era, NASA envisions:
  - Relay services for NASA missions are available on the TDRSS Continuation, which will replenish the fleet
  - All relay services are available to and shared by all users
  - The services are controlled or operated by NASA representing all stakeholders
  - Relay customers request services and are granted or denied services based on established mission priority and service availability
  - Mission priorities are established by a NASA stakeholder steering group
  - Information exchange is provided to NASA customers regarding status of service requests, status of ongoing services, anomaly resolution, periodic metrics reporting, etc.

NASA TDRSS Continuation Vision

- *Fully Integrated Laser and RF Communications*
- *TDRSS-C supports L1/L2, moon, and crosslink*



One Possibility for TDRSS-C / Near Earth Lasercom Integration



- Accommodates ≥1 Gbps from L2 and Lunar
- Accommodates multi-Gbps from LEO
- Best opportunity for supporting major growth in user data rates -- anticipated and unanticipated
- Lowest user payload mass/power for very high data rates
- May also reduce TDRSS S/C payload mass for very high data rates
- Immune to RFI, due to ultra-narrow beamwidth
- Fiber Power Amplifier Technology allows for flexibility in locating electronics package for both user and TDRS Relay
- Transmit command or beacon signal reduces burden on user acquisition and pointing
- Mass ~ 50 Kg; Power ~ 200 W

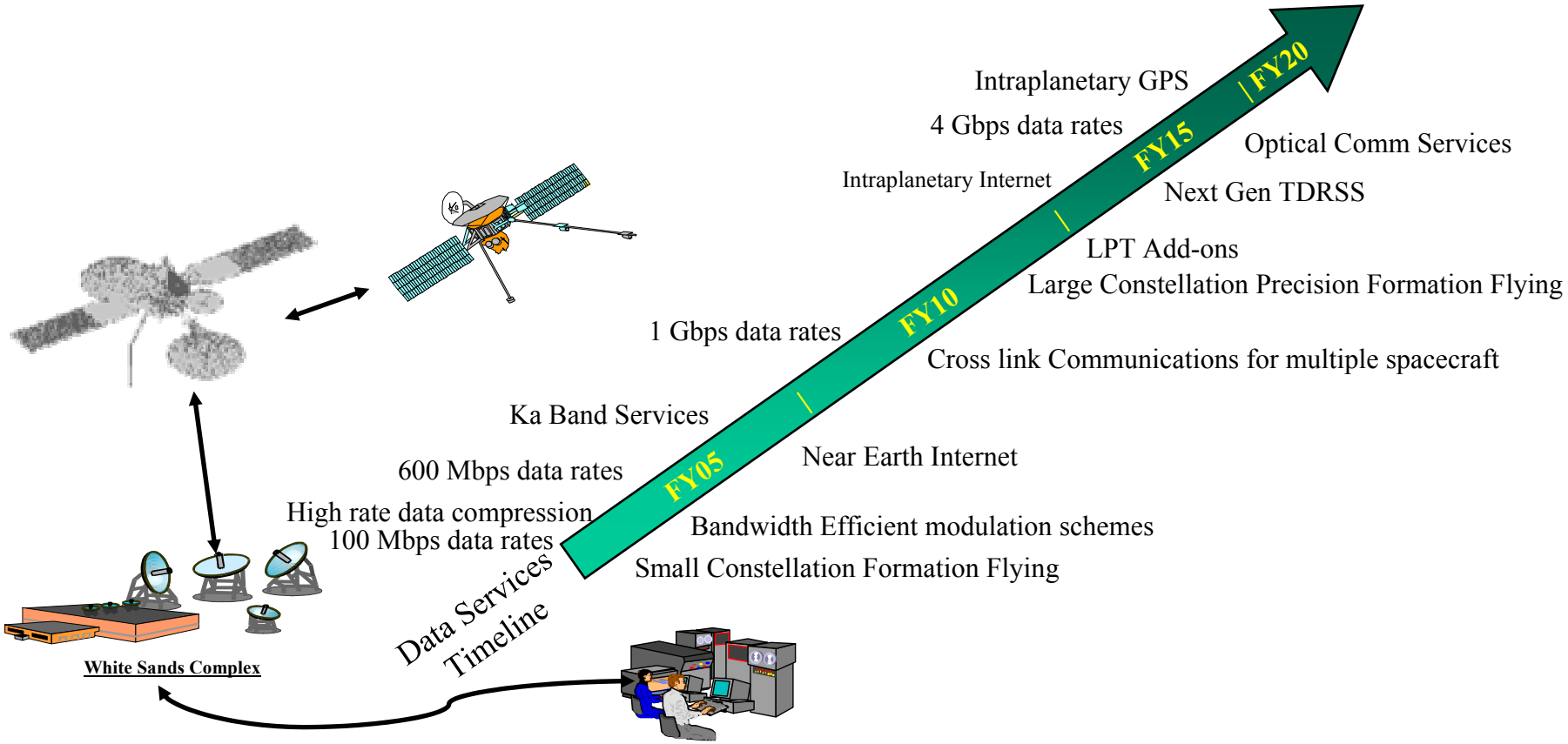
It is also technically possible to integrate a large Deep Space Lasercom terminal with a TDRS like spacecraft

TDRSS Continuation Summary

- Under TDRSS Continuation, NASA continues to operate a space-based Tracking and Data Acquisition infrastructure
- This infrastructure can accommodate expanding science and technology interests without impact from or impacting other government users

Backup

Technology Path to the Future



Future Architecture Activities

- NASA should assess its need for near-Earth Lasercom
- NASA should develop a roadmap towards a space based Earth Lasercom terminal.
  - Determine the number of terminals needed to support NASA's Lasercom needs:
    - LEO
    - L1, L2 and Lunar
    - Deep Space
  - Determine if the requirement exists for a multi-access Lasercom terminal.
  - Study whether the spacecraft should be an "edge service" satellite for either TCA or TDRS-C, or whether terminals should be integrated on TDRS-C. In either case a strawman spacecraft design should be done.
  - The roadmap should show what technology developments need to be done to reach TRL 6 or higher by 2007.
- Investigate an airborne terminal as a step on the migration path.

System Status Update

Ground Network

- Ground Network Capabilities in FY04 are uncertain
  - GN FY04 budget has not yet stabilized
    - McMurdo and Santiago services were submitted as overguide
    - All other Ground Network services were submitted inguide
    - Response to overguide request is expected shortly
    - CSOC to NENS transition costs will be better understood when NENS contract is awarded

- Santiago
  - Services will continue at least through the period of the current contract which ends December 31, 2003
  - If requested overguide is provided and/or if CSOC to NENS transition costs are less than planned, services will continue at the current level
  - If a new contract with reduced minimums is established, services may continue at reduced levels
  - Initial impact assessments:
    - SORCE – loss of several pass a month
    - TOMS-EP – loss of scheduling flexibility
    - ProSEDS – loss of planned support

- McMurdo
  - Services may be terminated on October 1, 2003
  - If requested overguide is provided services will continue at the current level
  - Evaluating X-Band only services via remote operations (high risk)
  - Initial impact assessments:
    - RadarSat 1 & ERS 2 – loss of all planned support
    - TRACE – loss of scheduling flexibility
    - ACRIMSAT, COBE, GRACE, QUikScat, SAC-C & WIRE – loss contingency support
    - DART – loss of planned support

- Expanded service initiatives
  - Enhancing 13-Meter antenna system (SG3) to provide third antenna option at Svalbard
    - Aqua and Aura compatibility enhancements complete – awaiting EOC and EDOS software mods for full testing
    - ICESat & QuikScat compatibility scheduled for November 2003
  - Enhancing MILA for orbital support capabilities to maintain proficiency and increase flexibility
    - Adding Closed IONet connectivity and PTPs
    - Enhancements will be complete by October 2003
  - Pursuing contingency support services from NOAA ground stations
    - EOS support from Gilmore Creek station
    - ADEOS II support from Wallops station

Space Network

Mission Services Customer Forum

July 17, 2003

Project Manager: Keiji Tasaki

Deputy Project Manager: Tom Gitlin

Business Manager: Paula Tidwell

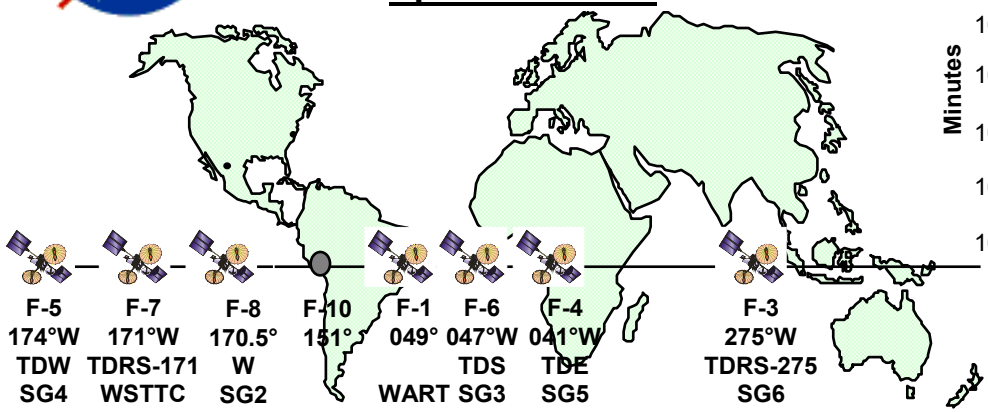
Agenda

- SN At A Glance
- TDRS 9 and 10 Operations Transition
- Summary of Recent New Capabilities
- Summary of Upcoming New Capabilities

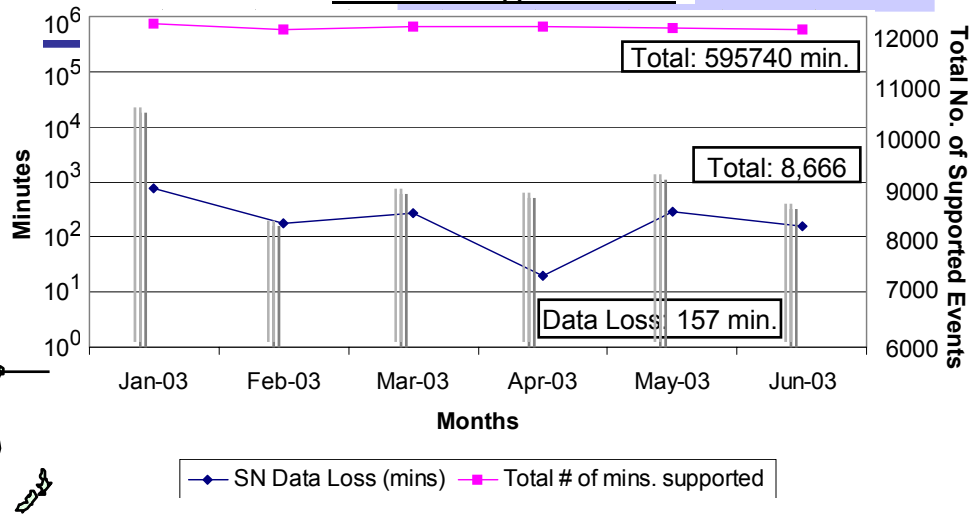
STATUS AS OF: 6/30/03

Operations and Maintenance

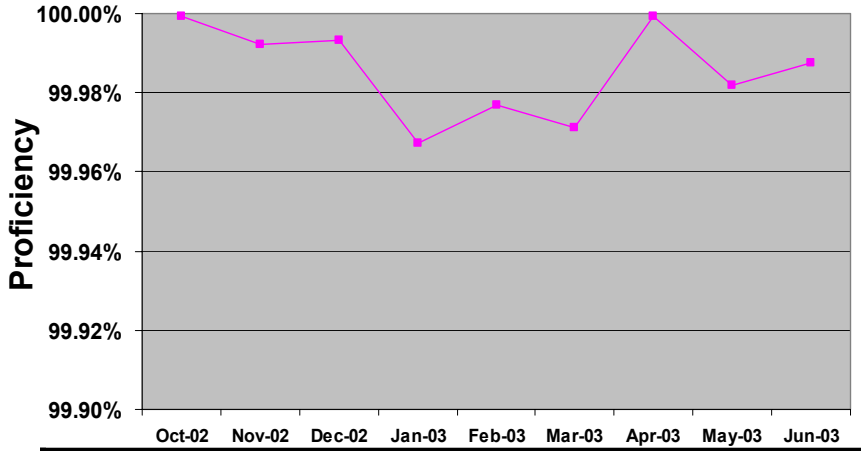
Space Network



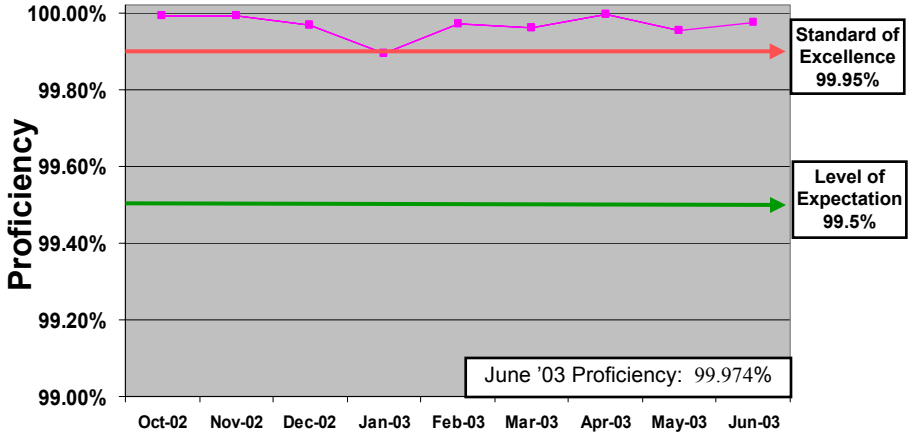
Minutes of Support and Minutes of Data Loss
Total No. of Supported Events



SN Critical Support Proficiency Trend



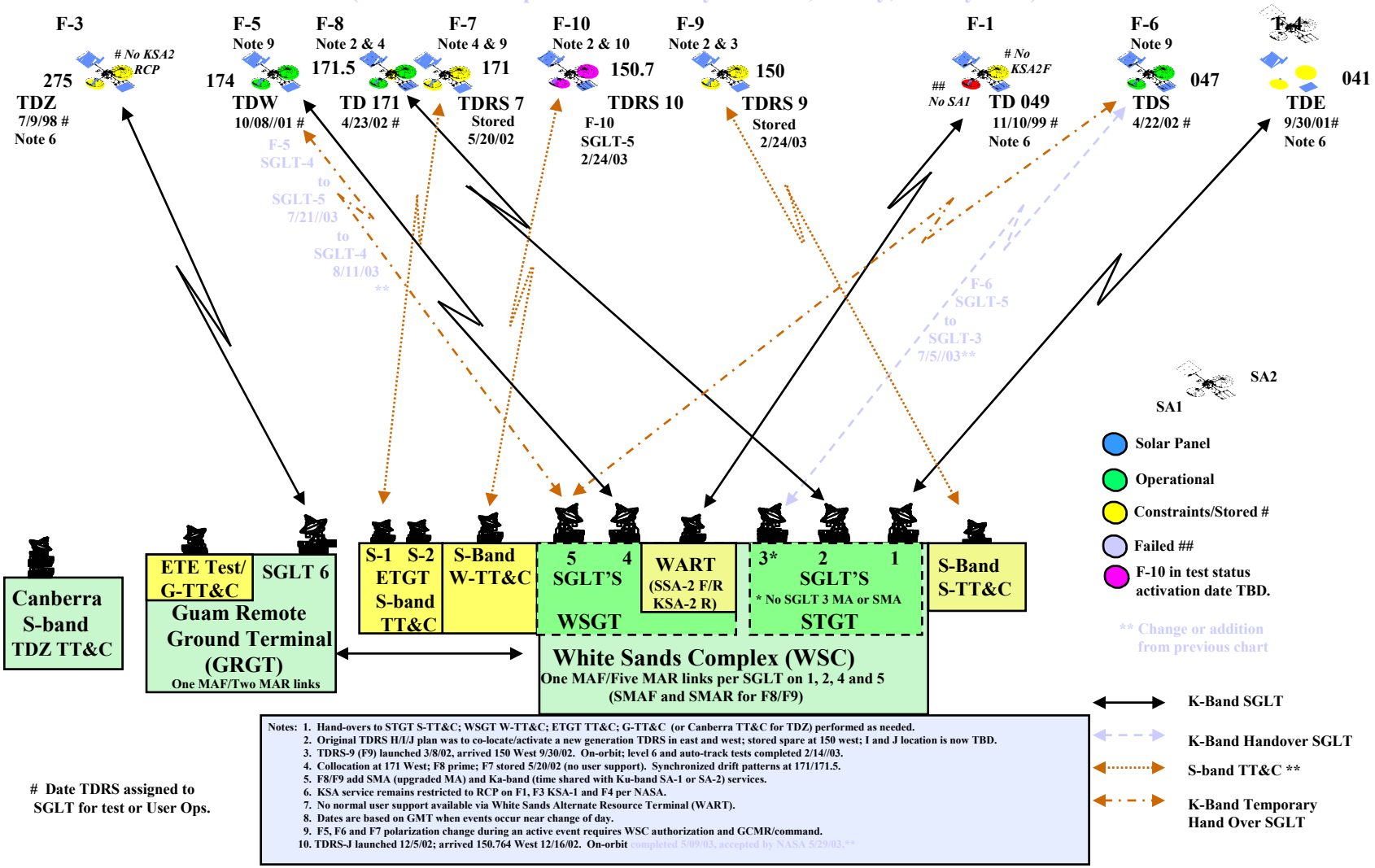
SN Proficiency Trend



Missions	Total No. of Supported Events	Service Stat.	Proficiency (%)	Standard of Excellence (%)
Aqua, ERBS, FUSE, HST, ISS, L-7, SP&M, TERRA, TOPEX, TRMM, UARS, XTE, LDBP, Sealaunch, Delta-II	**8,666**	**9,931 hrs. sched 9,929 hrs. actual 2 hrs. 37 min. lost**	**99.974%**	**99.95%**

Space Network Configuration – June – Aug. 2003

(5/30/03 Version per WSC SN Daily Forecast, Friday, 30 May 2003)



Notes:
1. Hand-overs to STGT S-TT&C; WSGT W-TT&C; ETGT TT&C; G-TT&C (or Canberra TT&C for TDZ) performed as needed.
2. Original TDRS H/I/J plan was to co-locate/activate a new generation TDRS in east and west; stored spare at 150 west; I and J location is now TBD.
3. TDRS-9 (F9) launched 3/8/02, arrived 150 West 9/30/02. On-orbit; level 6 and auto-track tests completed 2/14//03.
4. Collocation at 171 West; F8 prime; F7 stored 5/20/02 (no user support). Synchronized drift patterns at 171/171.5.
5. F8/F9 add SMA (upgraded MA) and Ka-band (time shared with Ku-band SA-1 or SA-2) services.
6. KSA service remains restricted to RCP on F1, F3 KSA-1 and F4 per NASA.
7. No normal user support available via White Sands Alternate Resource Terminal (WART).
8. Dates are based on GMT when events occur near change of day.
9. F5, F6 and F7 polarization change during an active event requires WSC authorization and GCMR/command.
10. TDRS-J launched 12/5/02; arrived 150.764 West 12/16/02. On-orbit completed 5/09/03, accepted by NASA 5/29/03.**

Date TDRS assigned to SGLT for test or User Ops.

F. Pfyer

TDRS-9 & -10 TRANSITION

- TDRS-8 was launched in June 2000 and became operational on April 2002 at the 171° West location
- TDRS-9 was launched in March 2002 and is located at the 150° West location.
  - On Orbit Test Review at Boeing Space Systems on Jun 27, 03
  - NASA accepted the spacecraft on July 7, 03 (DD250)
- TDRS-10 was launched in December 2002
  - Resolved issues regarding the turbo pump used in the Atlas RL-10.
  - Successfully conducted Vector Verification. on 20 Nov 02
  - NASA accepted the spacecraft in May 03.
- Plan being finalized for transition to operations

TDRS-9 & -10 TRANSITION (Cont'd)

- A number of transition scenarios have been proposed and examined, but no specific one has been chosen.
- Some of the criteria associated with managing the TDRS constellation are:
  - Minimization of user impact
  - Fuel availability of each spacecraft
  - Fuel usage for relocation
  - 1st Generation vs. 2 Generation spacecraft for DAS customers
  - Back-up spacecraft in case of failure
  - Time required to bring a back up spacecraft in to operations
  - Orbital slots – operational and storage
  - Inclination of each spacecraft
  - Age and condition of each spacecraft
  - Ground resource constraints – 6 SGLTs, 2 STTCs, WART, ETGT
  - Warranties associated with the 2nd Generation spacecraft
- There is no urgency to execute a transition plan.
- A plan will be selected and implement to put TDRS-9 into operations during the next two to three months, and then TDRS-10 will be put into operations.

Summary of Recent New Capabilities

- SN Web Services Interface (SWSI)
  - A Java based platform independent customer interface for submitting SN service requests and real-time monitoring and control of on-going service, via desktop computer to the NISN Open and/or Closed IOnet
  - SWSI Release 1.0 (SN Legacy services only): July 2003
  - SWSI Release 1.1 (New DAS MAR services): August 2003
- White Sands Complex (WSC) Transmission Control Protocol (TCP)/Internet Protocol (IP) Data Interface Service (SWSI)
  - Provides direct TCP/IP based telemetry and command services on the closed IOnet from the WSC.
  - Scheduling automation: **Dec 02**
  - Capacity expansion: **July 03**
- Demand Access Services (DAS)
  - Multiple Access Return services on demand.
  - Site Acceptance Testing Completed: July 03
  - Interim Operational Capability (IOC) Review: June 03
  - Final Operational Capability (FOC) Review Nov. 03

Summary of Upcoming New Capabilities

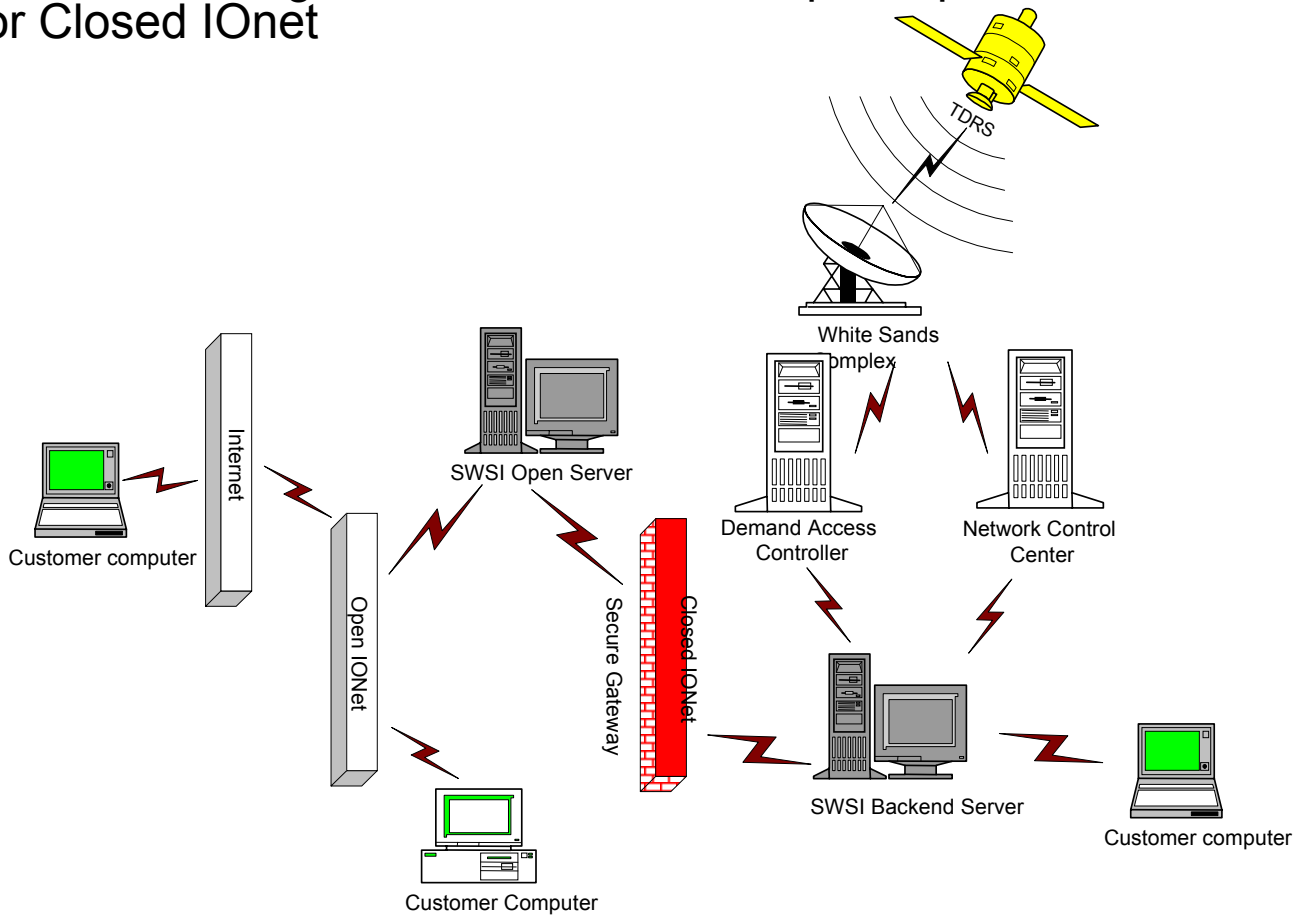
- Ka-Band Ultra-High Rate User Services
  - To provide a full data relay capability at >1Gbps using the 650MHz BW channel associated with TDRS-8, TDRS-9 and TDRS–10 at Ka-Band by 2006
  - Sys. Requirements, Ops. con., Proj. Mgmt Plan, PCD's, etc. to be completed by 9/30/03.
  - Separate the Ground Segment from the Space Segment effort, but maintain consistency.
- Guam Back-up Antennas
  - An 11-m and a 4.5-m
  - Funding and project lead identified; work initiated; 18-24 month schedule for completion.
- Guam Upgrades (As a result to Ind. Review Team Assessment)
  - 9 Action Items: Roof repair, emergency power, UPS batteries, etc.
- SN Access Sys. (SNAS)
  - UPS and SWSI replacement
  - Funding and project lead identified; SRR completed, 24 month schedule
- Bilateration Ranging Transponder Sys. (BRTS)
  - Purchase of 3-5 units to augment the current set
  - Funding and project lead identified; work on specifications initiated; 18-24 schedule
- Demand Access Sys. Forward Services (DAS Forward)
  - SN forward services on demand
  - Funding identified, but no project lead at this time.

Space Network

BACKUP CHARTS

Space Network Web Services Interface

- SWSI – SN Web Services Interface: A Java based platform independent customer interface to the NCCDS for performing TDRSS scheduling and real-time monitoring and control, via desktop computer to the NISN Open and/or Closed IOnet



SWSI Customers

- Current
  - Communications and Navigation Demonstrations on Shuttle (CANDOS)/Low Power Transceiver (LPT)
  - Long Duration Balloon Program (LDBP) Program
  - Solar Radiation and Climate Experiment (SORCE)
- Future
  - Swift Gamma Ray Burst Explorer (SWIFT)
  - Communications/Navigations Outage Forecasting System C/NOFS
  - Global Precipitation-B (GP-B)

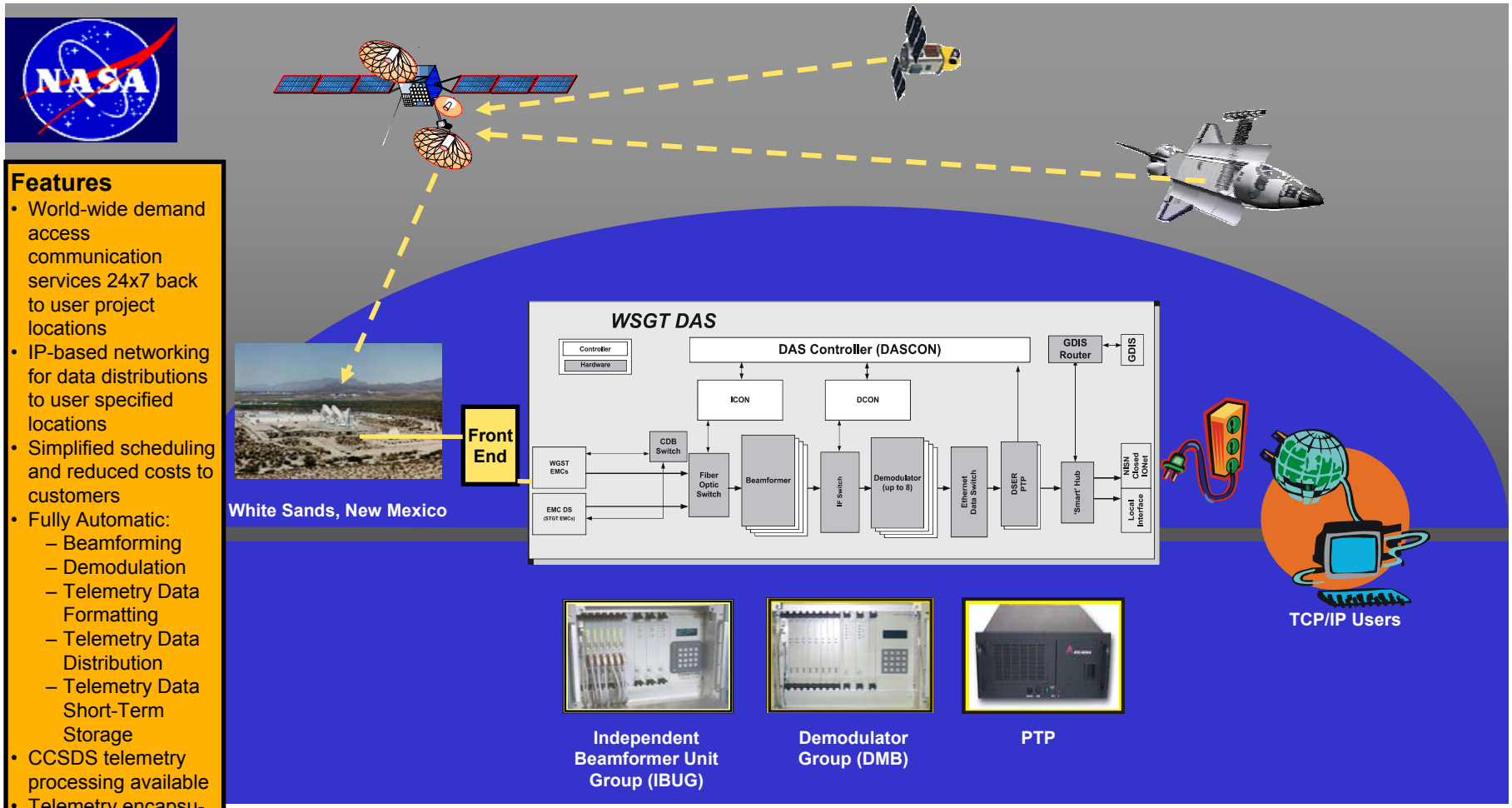
Demand Access Service (DAS)

- DAS is an MA return service that utilizes 3 TDRS (F-3 – F-7) nodes (041°W, 174°W, 275°W) to provide continuous global coverage.
  - A single user schedule can provide multi-year support
  - DAS automatically hands over from TDRS node to node for orbiting users
  - Data Rate from 1-150kbps/channel (subject to approval by MSP)
  - Customers use TCP/IP interface
    - Customers interface to DAS for scheduling and status monitoring through Space Network Web Services Interface (SWSI)
  - Low Cost based on node usage (subscription fee)
- DAS Applications
  - Emergency/Contingency (911 service) customer transmits when problem occurs. DAS is always “listening”
  - Science Alerts; Transmit when significant observations occur

Demand Access System (DAS)

Features

- World-wide demand access communication services 24x7 back to user project locations
- IP-based networking for data distributions to user specified locations
- Simplified scheduling and reduced costs to customers
- Fully Automatic:
  - Beamforming
  - Demodulation
  - Telemetry Data Formatting
  - Telemetry Data Distribution
  - Telemetry Data Short-Term Storage
- CCSDS telemetry processing available
- Telemetry encapsulation available for TCP/IP transport



DAS Customer Matrix (1 of 2)

As of 3/21/03

Project	AQUA	Swift	LDBP	ULDBP	AURA
Launch Date	Launched 5/4/02	Tests Begin 4/2/03 12/5/03	Tests Begin July 03 12/10/03-01/10/04	Tests Begin July 03 12/10/03-02/10/04	1/1/04
Inclination/Altitude (Km)	98.2°/705	22°/600	Antarctica/120K Feet	Antarctica/120K Feet	98.2°/705
PN Code	63	84	7,8,82,83,85	7,8,82,83,85	73
Antenna Type	Omni	Omni (2.2 dBW)	Omni	Steer Dish-.46M	Omni
Srvc Type (#of TDRSs)	All (TBD) (3)	Any (3)	Spec (1 TDRS at a time)	Spec (1 TDRS at a time)	All (TBD) (3)
Service Duration *	24x7 (911)	24x7 (911)	24x7 (cont ~30d)	24x7 (cont ~60d)	24x7 (911)
PTP Setup:					
Header	Async	LEO-T	Async	Async	Async
Frame Sync	N/A	Yes	N/A	N/A	N/A
VC Processing	N/A	Yes	N/A	N/A	N/A
Reed-Solomon	N/A	No	N/A	N/A	N/A
Tx Modulation Scheme	SQPN-Single	SQPN-Single	SQPN-Single	SQPN-Single	SQPN-Single
Data Rate - I Chnl	1 KB	1 KB	6 KB	150 KB	1.024 KB
Data Rate - Q Chnl	1 KB	1 KB	6 KB	150 KB	1.024 KB
I/Q Power Ratio	1:1	1:1	1:1	1:1	1:1
Symbol Format - I Chnl	NRZ	NRZ	NRZ	NRZ	NRZ
Symbol Format - Q Chnl	NRZ	NRZ	NRZ	NRZ	NRZ
Data Format - I Chnl	L	M	M	M	L
Data Format - Q Chnl	L	M	M	M	L
Acq Mode (700/3000)	700 Hz	700 Hz	3000 Hz	3000 Hz	700 Hz

* 911 = Occasional RF Transmission
cont = Continuous RF Transmission

DAS Customer Matrix (cont'd)

As of 3/21/03

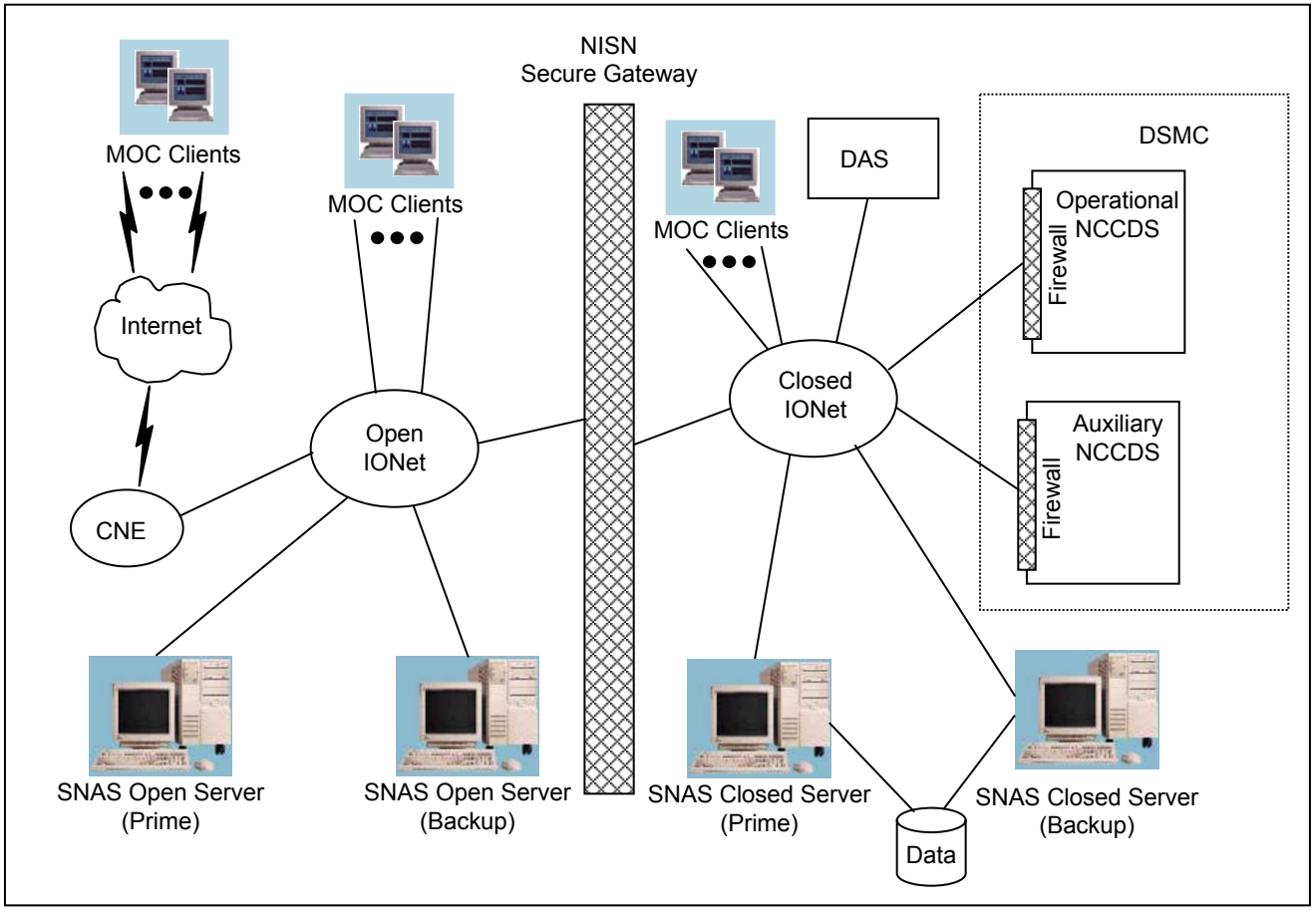
Project	C/NOFS	GLAST	GPM-1	GPM-2	ESA-GPM
Launch Date	Tests Begin 6/10/03 1/14/2000	3/1/06	11/1/07	8/1/08	2008 (TBD)
Inclination/Altitude (Km)	13°/400-710	28.5°/550	65°/400	98.2°/400-635	(TBD)
PN Code	9		32		
Antenna Type	Patch Ants (14.5 dBW)	Omni	Steer Dish- .76M	Steerable Dish (TBD)	Steerable Dish (TBD)
Srvc Type (#of TDRSs)	All (3)	All (3)	Any (TBD) (3)	Any (TBD) (3)	Any (TBD) (3)
Service Duration *	24x7 (cont)	24x7 (911)	24x7 (cont)	24x7 (cont)	24x7 (cont)
PTP Setup: Header Frame Sync VC Processing Reed-Solomon	 LEO-T No N/A N/A	 LEO-T Yes Yes No (TBD)	(TBD)	(TBD)	(TBD)
Tx Modulation Scheme	SQPN-Single	SQPN-Dual, or SQPN-Single (TBD)	SQPN-Dual	SQPN-Dual (TBD)	SQPN-Dual (TBD)
Data Rate - I Chnl	20 KB	1 KB	150 and 25 KB	? 50 KB (TBD)	(TBD)
Data Rate - Q Chnl	20 KB	1 KB	150 and 25 KB	? 50 KB (TBD)	(TBD)
I/Q Power Ratio	1:1	1:1	1:1	1:1	(TBD)
Symbol Format - I Chnl	NRZ	NRZ	NRZ	NRZ	(TBD)
Symbol Format - Q Chnl	NRZ	NRZ	NRZ	NRZ	(TBD)
Data Format - I Chnl	M	L (TBD)	L	L	(TBD)
Data Format - Q Chnl	M	L (TBD)	L	L	(TBD)
Acq Mode (700/3000)	700 Hz	700 Hz	3000 Hz (TBD)	3000 Hz (TBD)	(TBD)

* 911 = Occasional RF Transmission
cont = Continuous RF Transmission

Space Network Access System (SNAS)

- Purpose
  - Provides a single, standards-based customer interface for performing (TDRSS) scheduling and real-time service monitoring and control.
  - Provides for secure message exchange on all NISN and open networks and will implement the complete NCCDS and DAS customer interfaces.
  - Consolidates the functionalities of the SN Web Services Interface (SWSI) system and the User Planning System (UPS) into a single system, and will replace the UPS and SWSI as the primary scheduling interface between the SN customer and the SN.
- Developed to support all current SN customers
  - Scientific robotic missions
  - STS
  - ISS
  - Special Project
- SNAS will replace SWSI and User Planning System (UPS).

SNAS Architecture



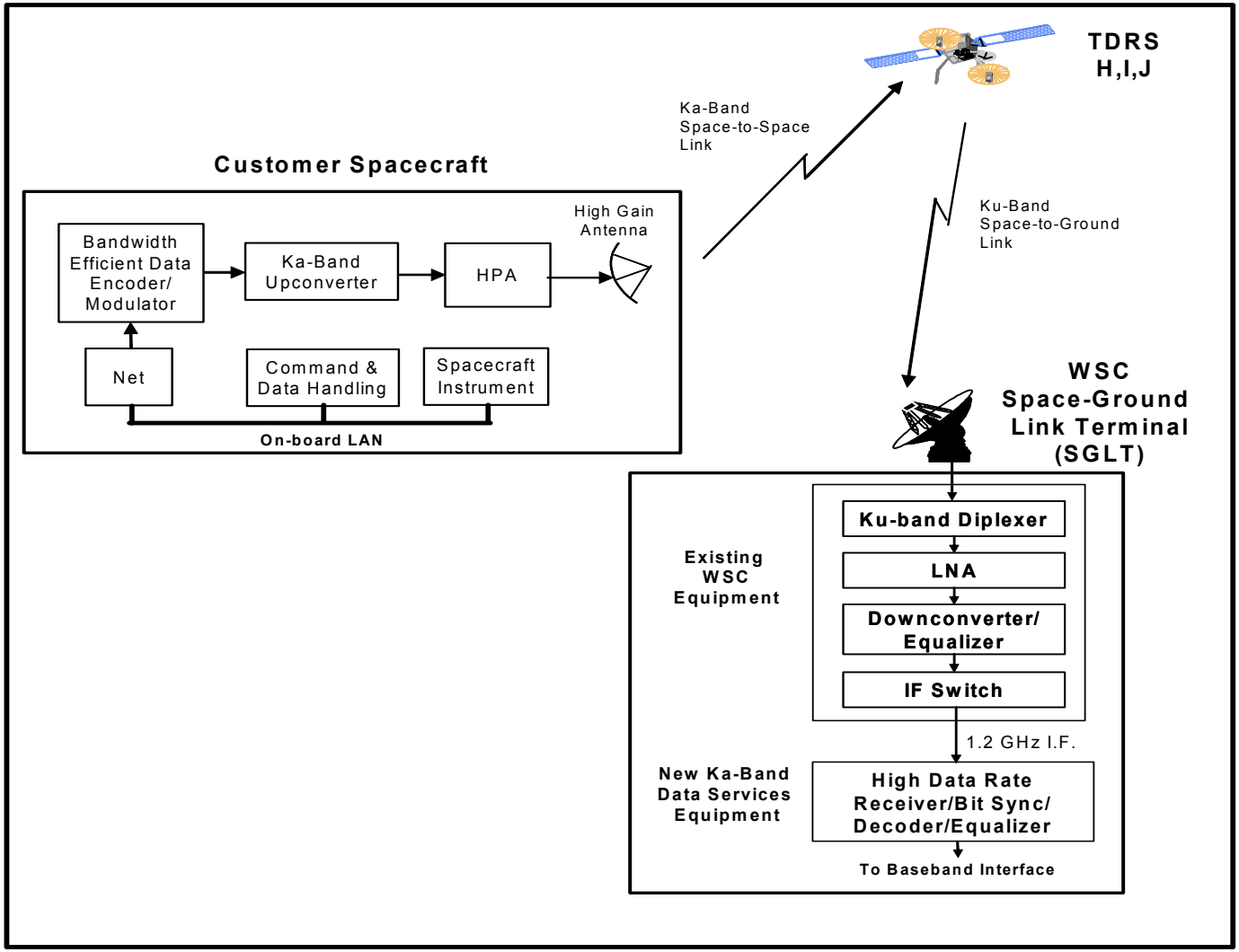
Ka-Band Ultra High Rate Development

- Space Network Ka-Band Ultra High Rate Development Plan
  - Fiscal Year 2003
    - Complete system requirements
    - Complete Ops Concept
    - Complete System Spec
  - Fiscal Years 2004-2005
    - Hardware Development and Testing
    - Demonstrations
  - Fiscal Year 2006
    - Establish Ka-band user services capability

Ka-Band Ultra High Rate Development

- In early 2000, NASA/GSFC initiated the Ka-band Transition Project as a first step in transitioning the SN and GN to Ka-band operations.
  - Develop new SN high rate telemetry service using TDRS H,I,J 650 MHz wide channel
  - Develop a GN station to demonstrate direct to earth Ka-band operations
  - Provide test bed within the SN and GN to demonstrate new communication technologies
  - High data rate demonstrations scheduled for fall 2002
  - Upgrade SGLTs to take advantage of TDRS H,I,J 650 MHz wide Ka-band channel.
  - Add new Downconverters, Equalizers, and IF switching.
  - Modify network control software for automated control and monitoring of new equipment.
  - Provide Ka-band return signals at a 1200 MHz IF compatible with the GN IF interface.
  - Accommodate SNIP space to space Ka-band frequency plan for both 225 MHz wide channel and the 650 MHz wide channel.

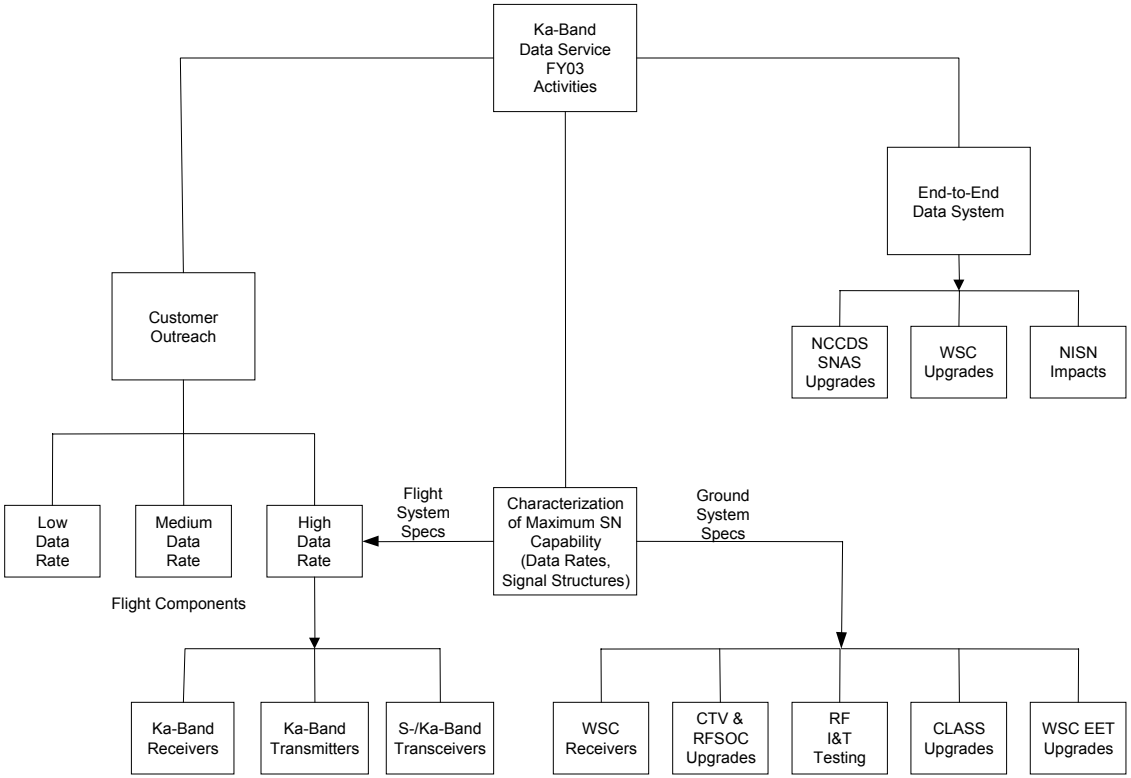
SN Ka-Band Data Services Customer Spacecraft and WSC Receive Segments



Ka-Band Ultra High Rate Development

Space Network Ka-Band Ultra High Rate Service Work Breakdown Structure

- System engineering and trade studies **to develop operations concept & system requirements documents by Sept 2003**
- Characterization **of maximum SN data rate capability**
  - **Drives WSC ground system specifications and customer support system capabilities**
  - **Driven by technology, such as bandwidth efficient modulation**.
- End-to-end data flow architecture **development for handling high rate data**
- Partnership Outreach
  - **Exploration of needs of future SN Ka-Band customers (at low, medium & high data rates)**
  - **Assessment of flight hardware availability & identification of technology/product gaps**



Flight Dynamics Facility

Ms. Donna Sadof
Flight Dynamics Facility/Network
Integration Center Manager
GSFC Code 450

FDF Support

- **Expendable Launch Vehicle (ELV)/Payload real-time support:**
  - Titan/B-35 ELV support on April 8
  - Atlas II/AsiaSat ELV support on April 11
  - ISS/Soyuz 6S Human Space Flight support on April 26
  - Pegasus/GALEX payload support on April 28
  - Atlas V/Hellasat ELV support on May 13
  - Sealaunch 11/Thuraya-2 ELV support on June 10
  - Delta II/MER-A ELV support on June 10
  - Delta II/MER-B ELV support on July 8

- **FDF has planned and supported 65 maneuvers during April-June 2003**

Code S Highlights

- FDF created SOHO-centered viewing data for the May 7th transit of the Solar disk by Mercury. The data included body angular separations, and angular sizes and distances of the bodies as viewed from SOHO. This transit provided the SOHO Project with a special opportunity for improved science instrument calibration.

- FDF is assisting the SOHO Project in the investigation of the High Gain Antenna (HGA) pointing failure. FDF is currently performing studies of possible smaller L1 halo orbits and the orbital transfer techniques for achieving them from the current halo orbit.

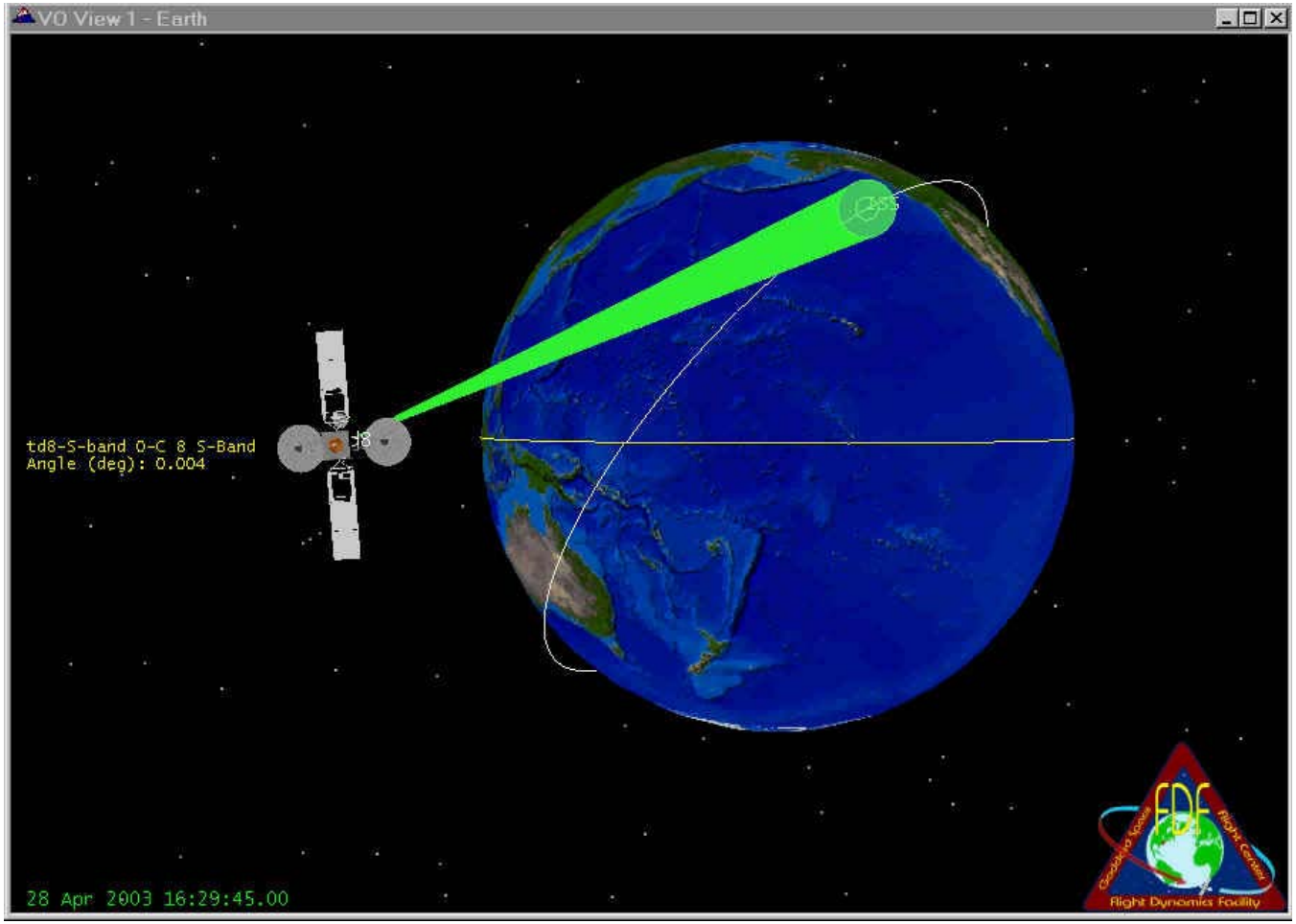
Code Y Highlights

- FDF developed and delivered scripts that will be used for planning the Aura ascent maneuvers. 6 large burns will raise Aura to the final mission orbit and achieve the proper phasing relative to the Aqua spacecraft.

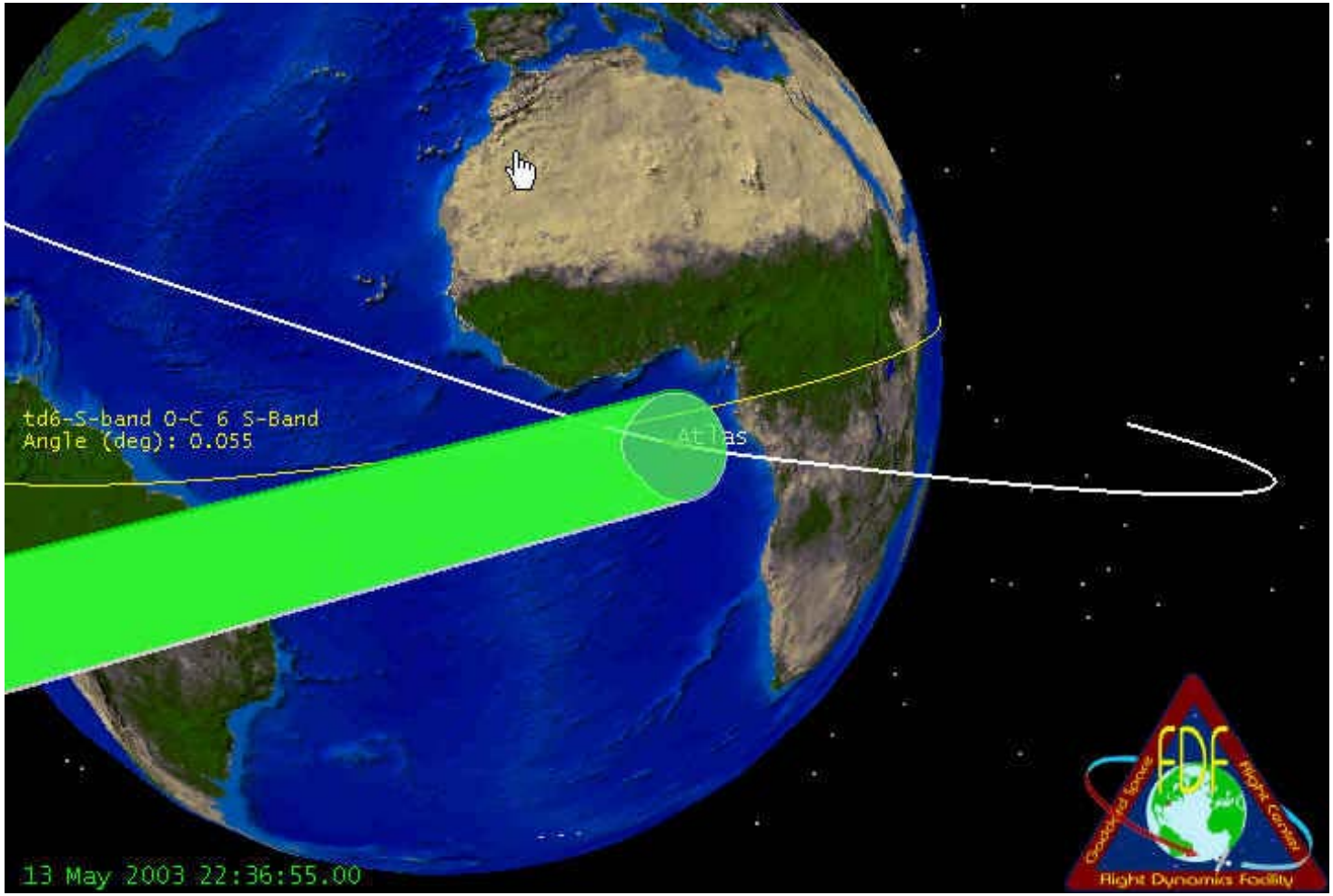
- FDF completed validating the RTOD™ orbit determination system to determine its suitability for Aura.

Code M Highlights

- Real-time TDRS Beam Angle Display
  - FDF currently generates tabular displays confirming commanded TDRS pointing is as expected
  - Displays are used during STS and ELV missions to confirm correct TDRS pointing
  - Replacement system uses Satellite Took Kit (STK) to generate real-time graphical and tabular displays
  - Display shows tracking geometry as well as position of spacecraft relative to the beam footprint



ISS pass on TDRS-8



TDRS-6 covering Atlas V/Hellasat transfer orbit burn

FDF Move to Building 13 Status

- First Phase
  - Establish a single string backup capability in building 13
  - String will be capable of supporting most FDF functions
  - No personnel will move
  - December 2003 is the planned completion date

- Second Phase
  - Move a second string to building 13 and make it the prime facility
  - Move personnel
  - A single string will be left in building 28 and it will become the backup
  - No scheduled completion date as yet

DSMC Status

Bob Hudgens

Consolidated Space Operations Contract

DSMC STATUS

- All Data Services Management Center (DSMC) systems and functions are operating nominally.

- The SN operational functions, i.e. ops interface activities, vector management for routine missions and ELV launches and scheduling operations continues to run very smoothly with no major system problems and very few operator errors.

- To maintain STS launch and landing vector management proficiency, monthly STS vector proficiency simulations are being run with FDF. Approximately two weeks prior to the STS-114 launch an FDF Analyst will travel to WSC to perform STS launch and landing vector management “refresher training”.

- WSC personnel are working with SN Web Services Interface (SWSI) and Demand Access System (DAS) engineers to test and integrate these new systems and operational functions into the DSMC.

DSMC STATUS

- GN scheduling operations continues to become more routine and less prone to operator error. Major training objectives for the expanded GN scheduling group are 75% completed, with an anticipated total completion date of October 2003. Continual GN scheduling proficiency training for the core SN schedulers on crew has improved the DSMC ability to provide a 24X7 GN contingency scheduling capability.

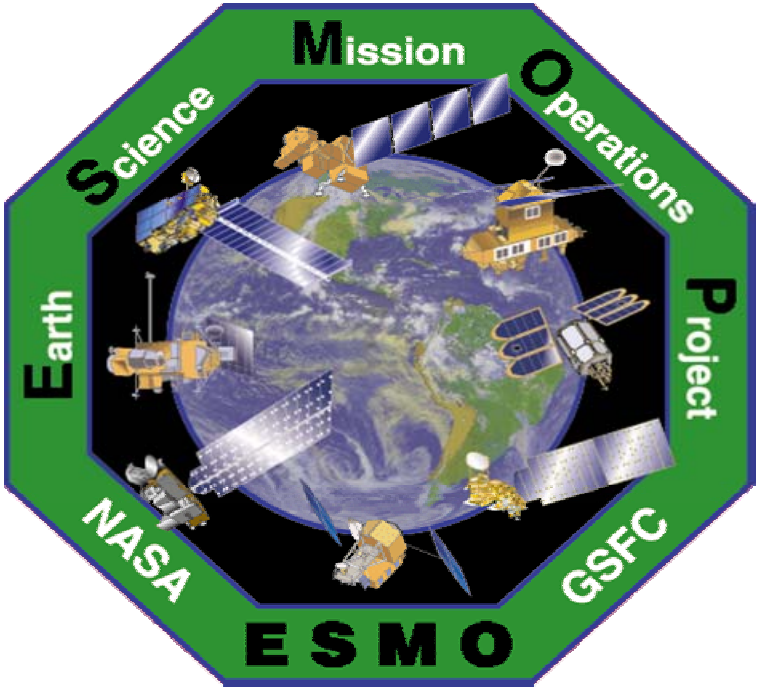
- One open security issue is being worked. The current DSMC GN scheduling system (WOTIS) configuration is not in compliance with NISN closed IOnet security protocol. The anticipated completion date to bring the configuration into compliance is July 31st.

- Monthly impacting GN scheduling operator errors continue to trend downward.

- To reduce the error rate, training activities are continuing, customer communication meetings are being held and off-line improvements to the system have been implemented.

Enterprise Updates

Earth Science Mission Operations (ESMO) Project



Edward J. Macie

July 17, 2003

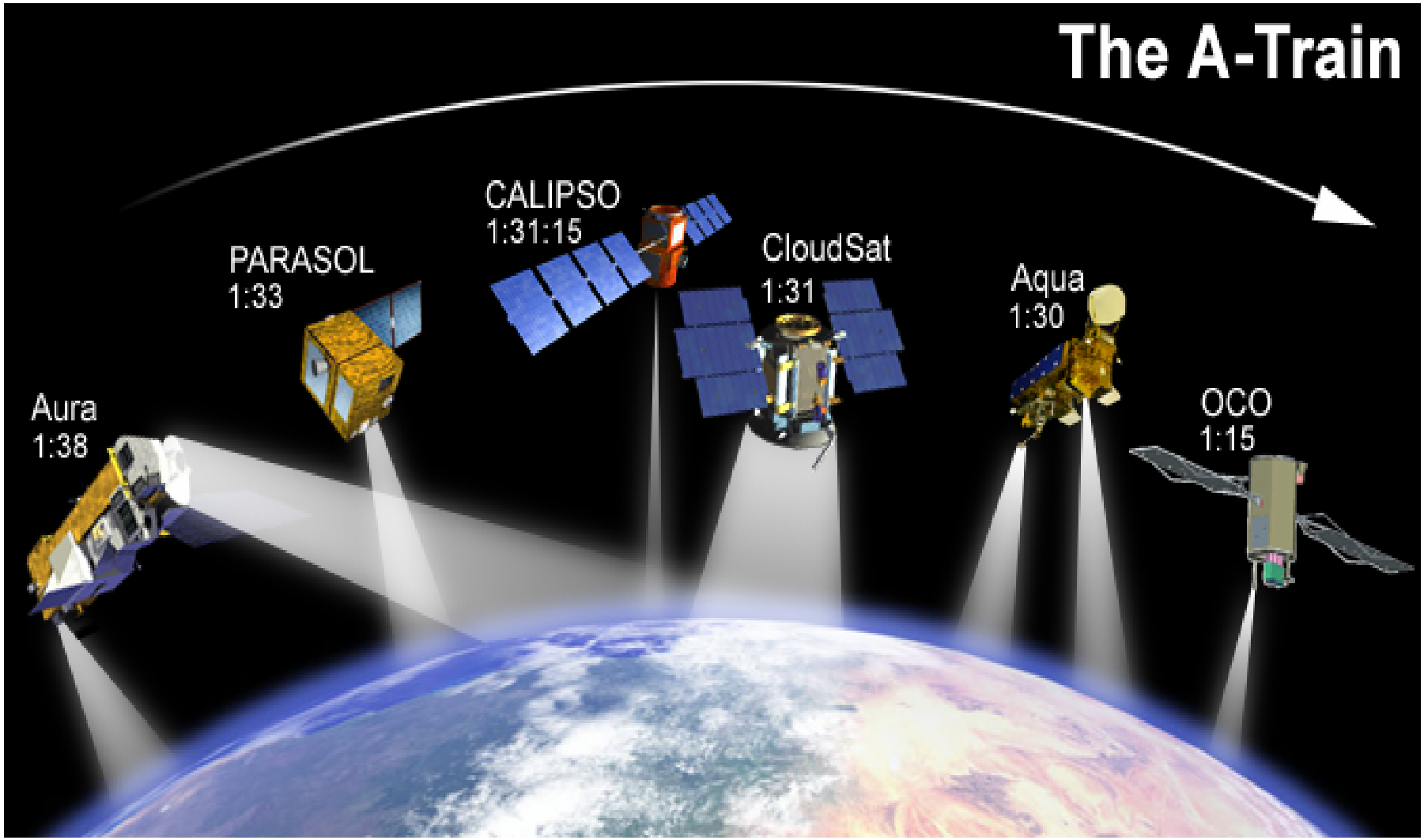
Code Y

- Transitioned SORCE to on-orbit operations, ICESat is to be transitioned
- Prepare for Aura launch and operations
  - Launch is NET January 29, 2004
  - Spacecraft and mission testing will intensify
  - Identify and resolve mission conflicts
- Continue CSOC to MOMS transition
  - Space utilization improvements in process
  - Property and documentation issues being resolved
- Continue Space Operations Institute efforts
  - Initiating test bed

Constellation Management

- Morning Train L-7/ EO-1/ SAC-C/ Terra
- A-Train - Aqua/ Aura/ Calipso/ Cloudsat/ Parasol/ Orbiting Carbon Observatory
- International partners
- Issues - Phasing of inclination maneuvers, Planning and Coordination of activities

Constellations



MISSION SERVICES CUSTOMER FORUM

Space Science Mission Operations Project (Code 444)

Ron Mahmot
Project Manager

Patrick Crouse
Deputy Project Manager

Valda Jones
Mission Business Manager

Andy Dantzler
Acting Senior Project Scientist

July 17, 2003

AGENDA

- Organization overview
- Current Missions
- Future Missions
- Selected Items of Interest
  - Space Link Extension (SLE)
  - IT Security
- Areas for More Work

Organization Overview

Space Science Mission Operations Project

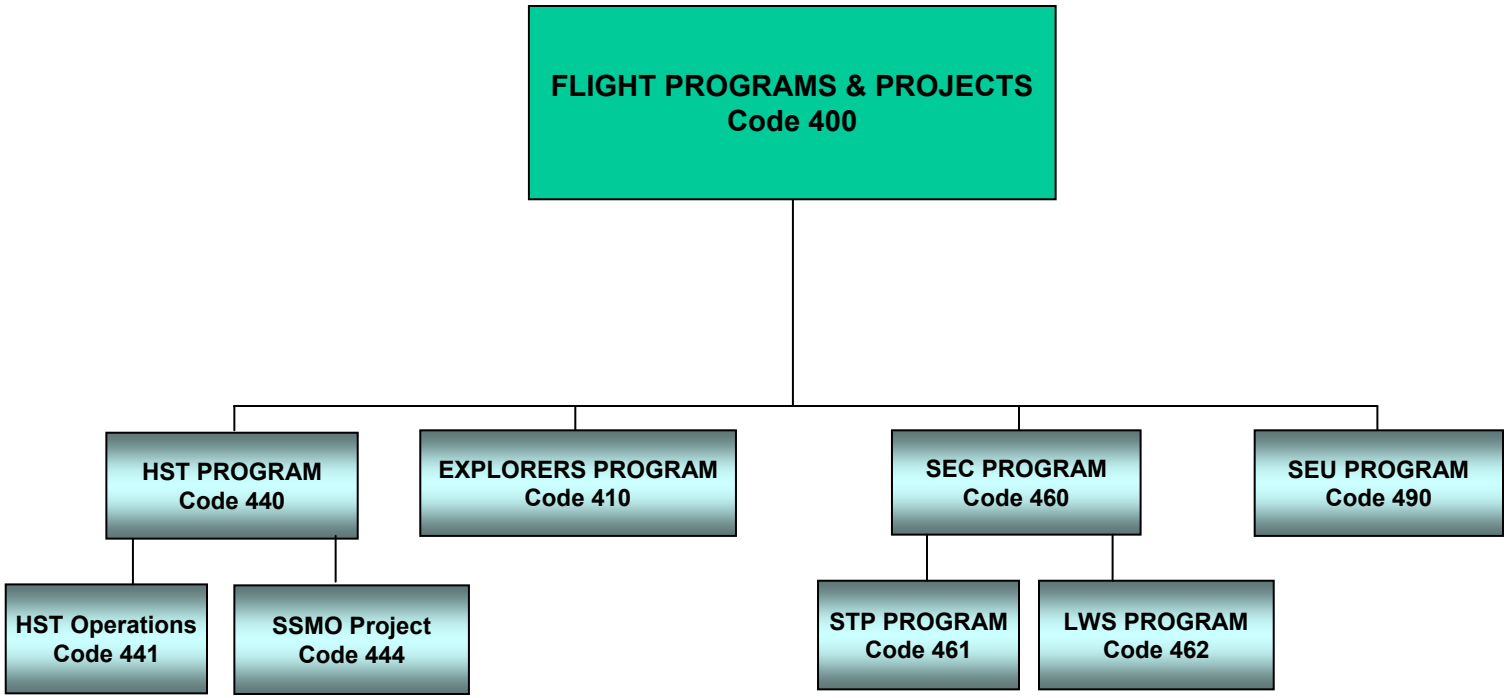
Charter

- SSMO has management responsibility for the safe and productive operations of Goddard Space Flight Center Space Science missions in the operations phase and for selected GSFC instrument operations on non-GSFC managed spacecraft operations
- SSMO works with missions in the development phase to feedback lessons learned and to ensure that operations concepts are sustainable
- SSMO works with the GSFC Mission Services Evolution Center (GMSEC) to ensure that the mission services infrastructure is kept current, and that technology development and infusion efforts are integrated with mission needs

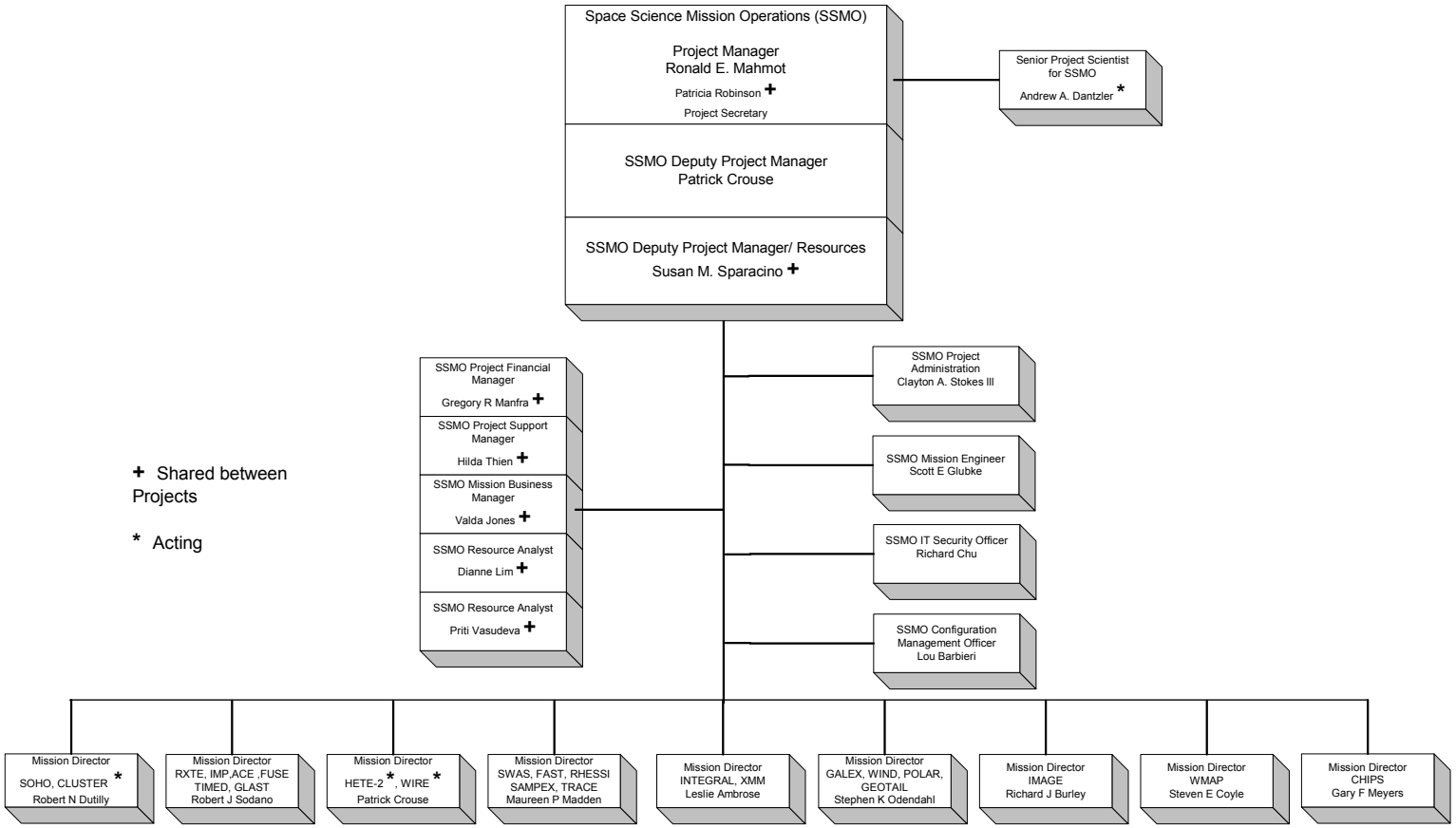
Operations Philosophy

- Mission safety is the number one priority
- Goal is to maximize science data collection within budget and risk constraints

Organization Overview



Organization Overview



Original Signed By **June 4 2003**

Ronald E Mahmot, Space Science Mission Operations Project Manager **Date**

Mission Set - Mission Parameters

Mission	Launch Date	Orbit Type	Attitude Control	Network	Control Center
ACE	**08/25/97**	**L1**	**Spin @ 5 rpm**	**DSN**	**GSFC/CSOC**
CHIPS	**01/13/03**	**600km circ @ 94 deg**	**3-axis**	**UCB/Adelaide/GN**	**UCB**
FAST	**08/21/96**	**4150 km X 348 km @ 83 deg**	**Spin @ 12 rpm**	**GN**	**UCB**
FUSE	**06/24/99**	**775 km circ @ 25 deg**	**3-axis**	**UPRM/GN/SN**	**JHU**
GALEX	**04/28/03**	**690 km circ @ 29 deg**	**3-axis**	**USN/SN**	**Orbital**
Geotail	**07/24/92**	**2 x 210 Re Equatorial**	**Spin @ 20 rpm**	**DSN/ESA**	**ISAS**
HETE-2	**10/09/00**	**625 km circ Equatorial**	**3-axis**	**MIT**	**MIT**
IMAGE	**03/25/00**	**1000 km X 45900 km @ 90 deg**	**Spin @ 0.5 rpm**	**DSN**	**GSFC/Honeywell**
WMAP	**06/30/01**	**L2**	**Spin @ 0.5 rpm**	**DSN**	**GSFC/Honeywell**
Polar	**02/24/96**	**2 X 9 Re @ 86 deg**	**Spin @ 10 rpm**	**DSN**	**GSFC/CSOC**
RHESSI	**01/24/02**	**600 km circ @ 38 deg**	**Spin @ 15 rpm**	**UCB/GN**	**UCB**
RXTE	**12/30/95**	**565 km X 583 km @ 23 deg**	**3-axis**	**SN**	**GSFC/CSOC**
SAMPEX	**07/03/92**	**550 km X 675 km @ 82 deg**	**3-axis**	**GN**	**BSU/GSFC/CSOC**
SOHO	**12/02/95**	**L1**	**3-axis**	**DSN**	**GSFC/CSOC**
SWAS	**12/02/98**	**600 km circ @ 70 deg**	**3-axis**	**GN**	**GSFC/CSOC**
TIMED	**12/07/01**	**625 km circ @ 74 deg**	**3-axis**	**APL/USN/SN**	**APL**
TRACE	**04/02/98**	**600 km X 650 km @ 97 deg**	**3-axis**	**GN**	**GSFC/CSOC**
Wind	**11/01/94**	**Variable/250 Re Max**	**Spin @ 20 rpm**	**DSN**	**GSFC/CSOC**

Mission Set
Reentry Analysis

Name of S/C	Earliest Reentry	Reentry Analysis Completion Date	Would uncontrolled reentry result in greater than 1 in 10,000?	Controlled reentry via thrusters possible?	Shuttle return possible?	End of Mission Plan Completion Date	Comment
WIRE	10/2005	10/2000	No (5.75 m^2)	No	No	TBD	DAS 1.0 analysis. 254 Kg Mass
SAMPEX	11/2008	02/2001	No (1.44 m^2)	No	No	TBD	DAS 1.0 analysis. 161 Kg Mass
RXTE	8/2009	07/2001	Yes (30.3 m^2)	No	No	TBD	DAS 1.5.3 analysis. 3031 Kg Mass
HETE-2	2011	05/2000	No (<1 m^2)	No	No	TBD	DAS 1.0 analysis. 125 Kg Mass
TIMED	2015	4/1999	Yes (9.2 m^2)	No	No	TBD	DAS 1.0 analysis. 587 Kg Mass
TRACE	07/2020	1/2002	No (6.74 m^2)	No	No	TBD	DAS 1.5.3 analysis. 214 Kg Mass
FAST	2027 +	03/2002	TBD	No	No	TBD	187 Kg Mass
FUSE	2027 +	05/2002	TBD	No	No	TBD	1335 Kg Mass
SWAS	2027 +	07/2002	TBD	No	No	TBD	283 Kg Mass
GEOTAIL	Centuries	N/A	N/A	No	No	TBD	9 R_e x 30 R_e Orbit
IMAGE	Centuries	N/A	N/A	No	No	TBD	1000 x 7000 Km Orbit
IMP-8	Centuries	N/A	N/A	No	No	TBD	35 R_e Orbit
POLAR	Centuries	N/A	N/A	No	No	TBD	2 R_e x 9 R_e Orbit
WIND	Centuries	N/A	N/A	No	No	TBD	5 R_e x 185 R_e Orbit
ACE	Never	N/A	N/A	No	No	TBD	L1 Orbit
SOHO	Never	N/A	N/A	No	No	TBD	L1 Orbit
	Spacecraft may violate 25 years after end of mission guideline					Spacecraft violates 8 m^2 debris casualty area guideline	

Mission Set
Future Missions/Strategic Planning

- Establishing Memorandums of Agreement with Space Explorers, Sun Earth Connections, and Structure and Evolution of the Universe Programs
  - Involve operations early in the project life cycle (operations concept development, trade studies, best practices/lessons learned)
  - Communicate SSMO requirements and criteria for successful transition
  - Facilitate maintenance and evolution of operations infrastructure

- Working with the GSFC Mission Services Evolution Center (GMSEC) to ensure that the mission services infrastructure is kept current, and that technology development and infusion efforts are integrated with mission needs

- Some missions of particular interest:
  - Swift – University based operations/DAS user - ’04
  - Stereo – 2 satellites at Lagrange points – ’05
  - THEMIS – 5 satellites, UCB operations – ‘06
  - GLAST and SDO – GSFC-based operations - ‘06-’08 timeframe
  - MMS – constellation operations -’09

Selected Items of Interest

Space Link Extension (SLE)

- Agreed to eliminate use of 4800 Bit Block communications with DSN
- DSN and ESA currently use SLE (Ex: Integral) to facilitate interoperability
- SSMO is currently providing WIRE as an on-orbit asset to evaluate AVTEC system in Wallops antenna
  - Commanding performed from Houston during this phase
  - SSMO and GMSEC anticipate continuing effort from GSFC
  - Evaluating SLE as candidate for 4800 BB replacement with DSN
- Considering demonstration/test of SLE for SOHO commanding via ESA assets

Selected Items of Interest

IT Security

- Recent decision to move JPL/DSN off of the Closed IONet
  - Creation of “Restricted” IONet
  - Migration timeline to be established
  - “Transparent” to the user
  - Implications for GN?
- Implementation of SAFS/CSAFS architecture
  - Are all operations concept concerns addressed satisfactorily

Areas for More Work

- Understand impact of recent SOHO High Gain Antenna anomaly
  - Establish new tracking requirements for DSN
  - Update procedures, processes, and documentation to reflect operations concept
- Continue along path of increased automation (Wind/Polar/ACE)
- Establish Svalbard as a SMEX (particularly TRACE) GN resource
- Work CSOC to Mission Operations and Mission Services (MOMS) transition
- Define requirements and establish viable backup control centers as necessary
- Keep lines of communication open
  - Separate Services (Mission and Data)
  - Still an integrated and interrelated system

Acronym List

ACE	Advanced Composition Explorer
APL	Applied Physics Laboratory (JHU)
CDHF	Central Data Handling Facility
CHIPS	Cosmic Hot Interstellar Plasma Spectrometer
CSOC	Consolidated Spacecraft Operations Contract
DPU	Data Processing Unit
DSN	Deep Space Network
ESA	European Space Agency
ESTEC	European Space Research & Technology Centre, Noordwijk, Holland
FAST	Fast Auroral SnapshoT Explorer
FDF	Flight Dynamics Facility
FOT	Flight Operations Team
FUSE	Far-Ultraviolet Spectroscopic Explorer
Geotail	Geomagnetic Tail Laboratory
HETE	High Energy Transient Explorer
IMAGE	Imager for Magnetopause-to-Aurora Global Exploration
IMP	Interplanetary Monitoring Platform
IRU	Inertial Reference Unit
JHU	Johns Hopkins University
LASP	Laboratory for Atmospheric and Space Physics
MAP	Microwave Anisotrophy Probe
NISN	NASA Integrated Services Network
OSS	NASA's Office of Space Science
PACOR II	Packet Processor
PI	Principal Investigator
Polar	Polar Plasma Laboratory
PSLA	Project Service Level Agreement
RHESSI	Reuven Ramaty High-Energy Solar Spectroscopic Imager
RXTE	Rossi X-Ray Timing Explorer
SAMPEX	Solar Anomalous Magnetospheric Particle Explorerrer
SDP	Science Data Processing
SEC	Sun-Earth Connection
SMEX	Small Explorers
SODA	Space Operations Development Activity
SOHO	Solar Heliospheric Observatory
SOMO	Space Operations Management Office
SOW	Statement of Work
SSMO	Space Science Mission Operations
SWAS	Submillimeter Wave Astronomy Satellite
TDRSS	Tracking and Data Relay Satellite System
TRACE	Transition Region and Coronal Explorer
UCB	University of California at Berkeley
Wind	Interplanetary Physics Laboratory

Human Spaceflight

J. Bangerter
NASA Network Director for Human Spaceflight
Goddard Space Flight Center, Code 451

Agenda

- Return to Flight Re-validation of the Integrated Network Elements
- ISS Backup Control Center "Keep Science Alive"
- 150 Mbps Testing
- ISS Downlink Enhancement Architecture (IDEA)
- Automated Transfer Vehicle (ATV)/H-II Transfer Vehicle (HTV) Activities
- COL-T/JEM Activities

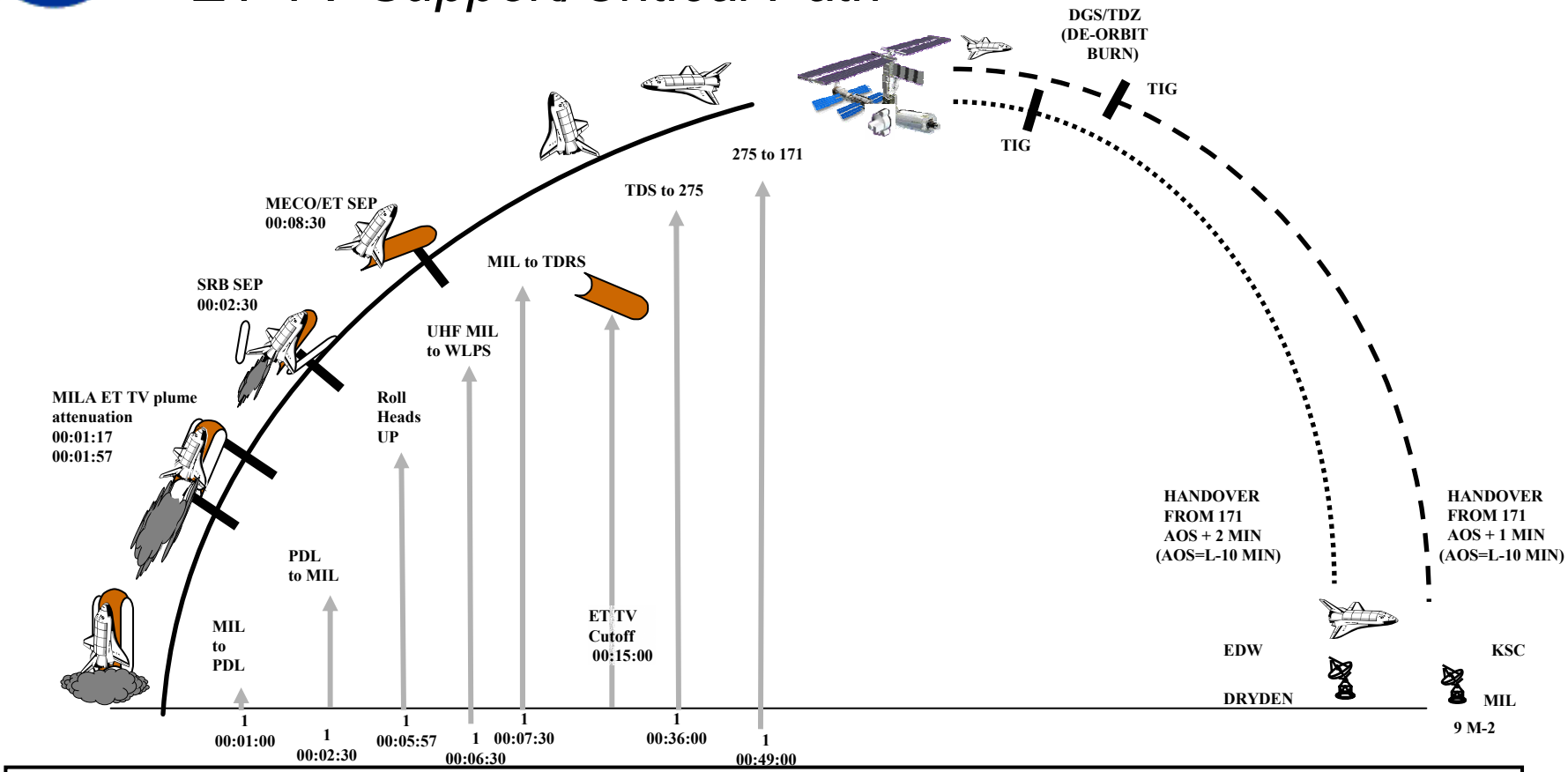
Return to Flight Re-Validation for the Integrated Network Elements

- All Network sites and supporting elements are teamed to re-validate the Integrated Network: WSC, NISN, FDF, AFSCN RTS, DFRC WATR, WFF, MILA/PDL, and the NIC
- The team has developed an Integrated Network test program to be implemented by GSFC focusing on critical path support activities such as ascent, orbital, entry, and landing
- The re-validation process encompasses verification and validation of new program requirements, significant network changes and anomalies, as well as any safety and security concerns
- An Integrated Network Operations Readiness Review (ORR) will be conducted approximately 30 days prior to the launch
- Participation in the Mission Operations Directorate (MOD) and Level I/II Flight Readiness Reviews (FRR) will provide the Integrated Network readiness status to the Space Shuttle Program (SSP).

Return to Flight Re-Validation for the Integrated Network Elements (cont'd)

- Integrated Networks Test Plan
  - Provides direction of testing for re-validation of the Integrated Network and Return to Flight of Space Shuttle missions
    - Verification/validation tests, Integrated Network joint simulations, Terminal Countdown Demonstration Test [TCDT], and Range Safety TLM verification tests will be conducted
    - Scripts and test scenarios will be provided by briefing message for launch, on-orbit, and landing support simulations
    - Special testing for mission and payload related activities will be outlined in the Test Plan
    - New Integrated Network requirements will be tested such as External Tank Television (ET TV)
      - Existing STS-112 ET TV system will be reverified for debris monitoring during launch
      - Testing for optional second link is being analyzed

ET TV Support/Critical Path



Notes:

1. TEL-4; PDL and JDI acquired sequentially at 00:00:10; 00:00:15 and 00:00:36.
2. WPS tracks STS; not ET link as tank drops away.

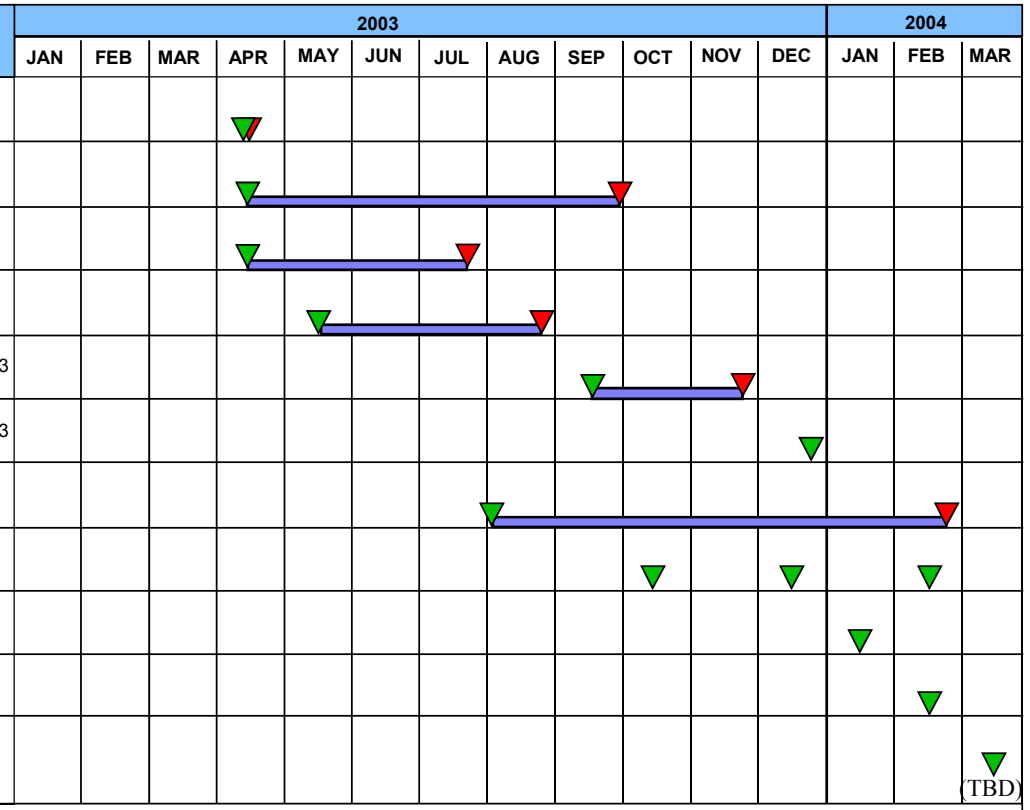
ET TV Coverage

(Based on STS-112 data)

Schedule of Events

Date: June 20, 2003

	Task	Start	End
1	Kick off meeting with team	4/14/03	4/14/03
2	Weekly meetings for return to flight	4/15/03	9/30/03
3	Identify test requirements	4/15/05	7/23/03
4	Develop test plan*	5/15/03	8/27/03
5	Internal and external reviews	9/16/03	11/27/03
6	Plan published	7/31/03	12/21/03
7	Testing with stations	8/1/03	2/22/04
8	Aircraft flybys at MILA and DFRC	8/12/03	9/7/03
9	Preliminary ORR	2/15/04	2/15/04
10	Network ORR	2/15/04	2/15/04
11	STS return to flight launch	3/16/04	3/16/04



Notes: *Plan assumes that new Network Requirements have been provided by JSC in a timely manner.

Planned

gsfc-2376milestone.dsf

ISS Backup Control Center "Keep Science Alive"

- Today, if ISS Mission Control Center shutdown due to adverse weather or other extenuating circumstances, the Backup Control Center (BCC) in Moscow performs command and receives telemetry only
  - MSFC has no command capability and therefore cannot “keep science alive”
  - An assessment of other scenarios are being worked to establish a command link through TDRS in order to set up a BCC for science data

- Several scenarios have been looked at including utilizing GSFC as the ISS BCC for science

150 Mbps On-Orbit Testing

- ISS Ku-Band High Data Rate (HDR 50-75-150 Mbps) was tested during TDRSS Compatibility testing (’95/’98). To date, the 50 Mbps capability has been successfully tested and used on-orbit for transport of ISS science data. However, the 75-150 Mbps rates have not been tested on-board

- A plan is being developed to test the higher data rates on-orbit. This testing will evaluate signal level performance of the higher rates during specific attitudes and using best/worst case pointing

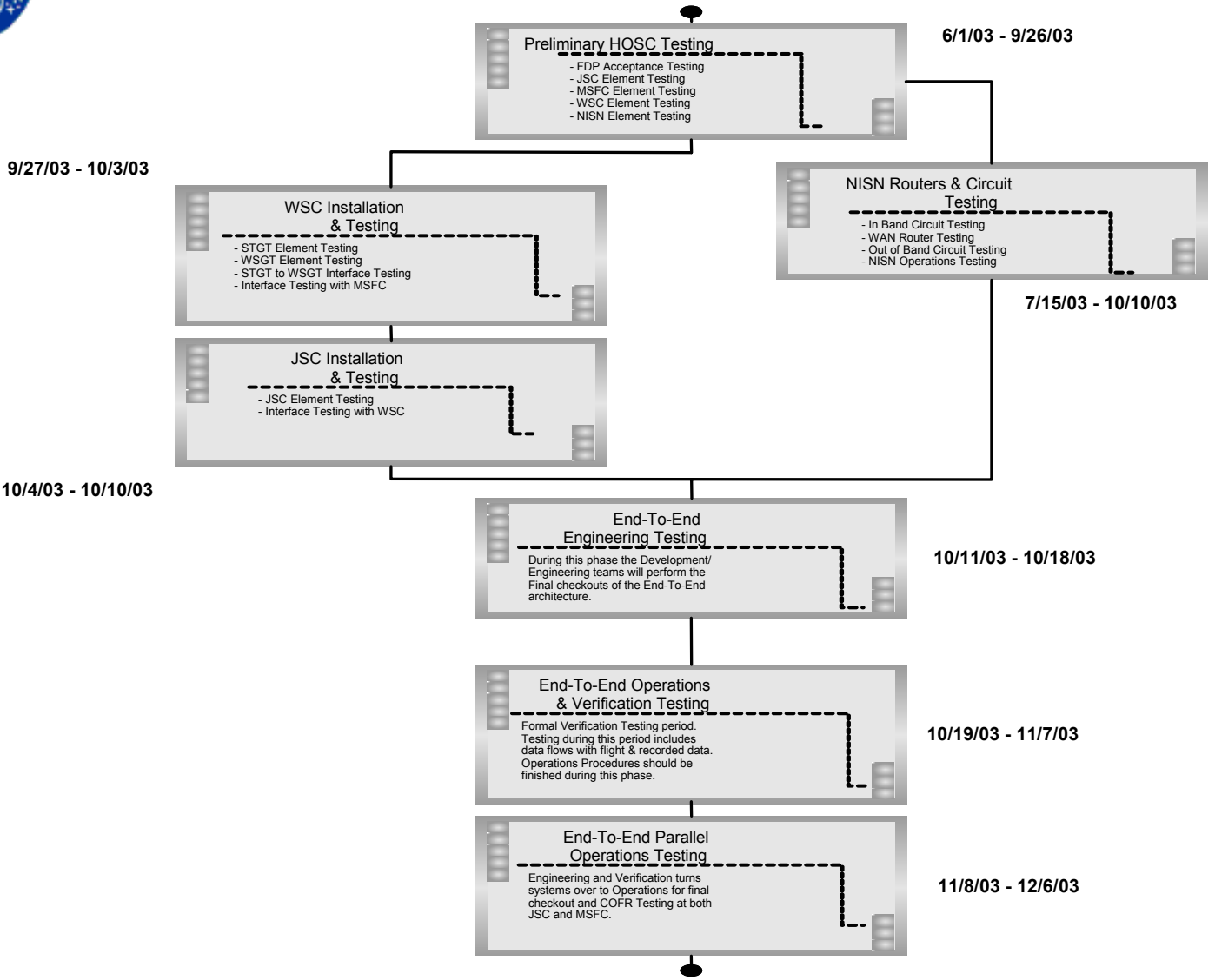
- The test is lead by JSC with support from GSFC and WSC during test set-up, data capture, and signal performance evaluation

- The test is currently planned for the week of August 4, 2003

ISS Downlink Enhancement Architecture (IDEA)

- IDEA is a ground systems infrastructure that will provide the ISS program the ability to enhance its science return from 50mbps to 150mbps over the Ku band downlink and reduce operations, NISN communications link, and sustaining engineering costs
- The main objective of IDEA is to replace the existing DOMSAT commercial link and implement common FEP architecture at WSC and feed JSC and MSFC unique components at ISS downlink rates up to 150 mbps. This will be done in two phases
  - Phase 1 is to replace the existing DOMSAT commercial satellite transponder service with a fiber terrestrial communications network for data distribution
  - Phase 2 is to reconfigure the IDEA system at WSC to perform data extraction and distribution to JSC and MSFC. The system reconfiguration will move the front end processing of the Ku-band downlink from JSC and MSFC to WSC
- **Current Activities**
  - Integrated Network Test Plan is currently being developed
    - Network testing of the IDEA will validate the functional system architecture and provide training
    - Network simulations will verify all system interfaces, requirements, failovers, and failure scenarios
  - Phase I planned completion date is November 30, 2003
  - Phase II planned completion date is December 2004

IDEA Integrated Validation Testing Schedule



ATV/HTV Activities

- **ESA Automated Transfer Vehicle (ATV) and NASDA H-II Transfer Vehicle (HTV) are logistics modules which will be used to re-supply the International Space Station (ISS)**

- **ATV**
  - Launch Date: September 2004
  - Initial compatibility testing (Category I: engineering-level vehicle equipment) testing was successfully completed in January 2002
  - Follow-on Testing (Category II ATV Integrated Avionic Flight Equipment) is planned for April 2004

- **HTV**
  - Launch Date: December 2007
  - Initial compatibility testing (Category I: engineering-level vehicle equipment) testing is planned for February 2004
  - Follow-on Testing (Category II HTV Integrated Avionic Flight Equipment) is planned for December 2004

COL-T and JEM Activities

- **ESA Columbus-Terminal (COL-T) is the interface for ESA science control and telemetry. The NASDA Japanese Experiment Module (JEM) is the Japanese science lab. The communications for these systems will be Ka-Band.**

- **COL-T**
  - TDRSS is under investigation for initial backup to ARTEMIS (ESA Data Relay Satellite) and eventually prime Ka-band interface after ARTEMIS

- **JEM**
  - Currently at KSC for integration testing
  - The ISS Program Office is investigating the use of the JEM Ka-band interface as a backup to the ISS Core Ku-band system

Loading and Resource Issues

7/17/03

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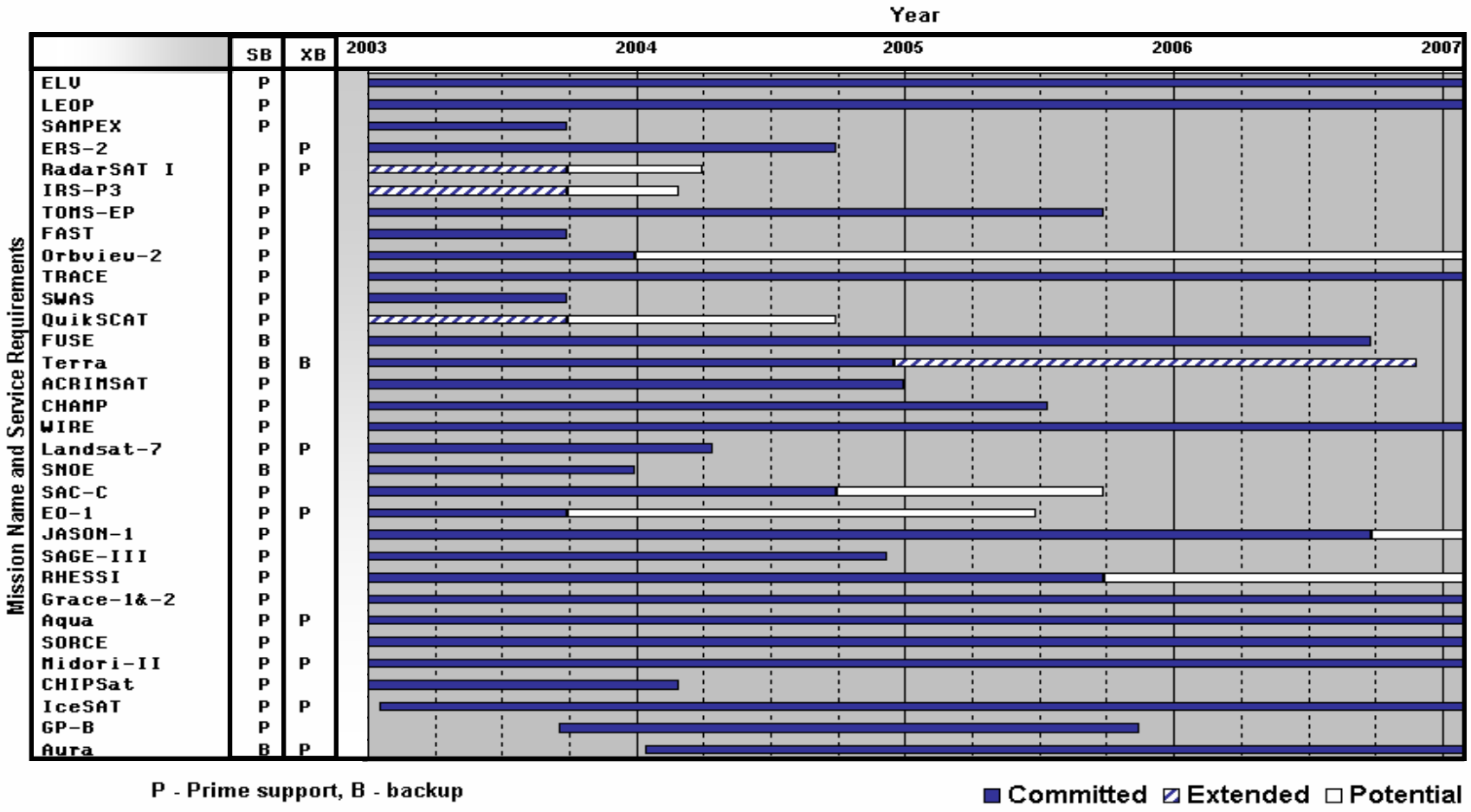
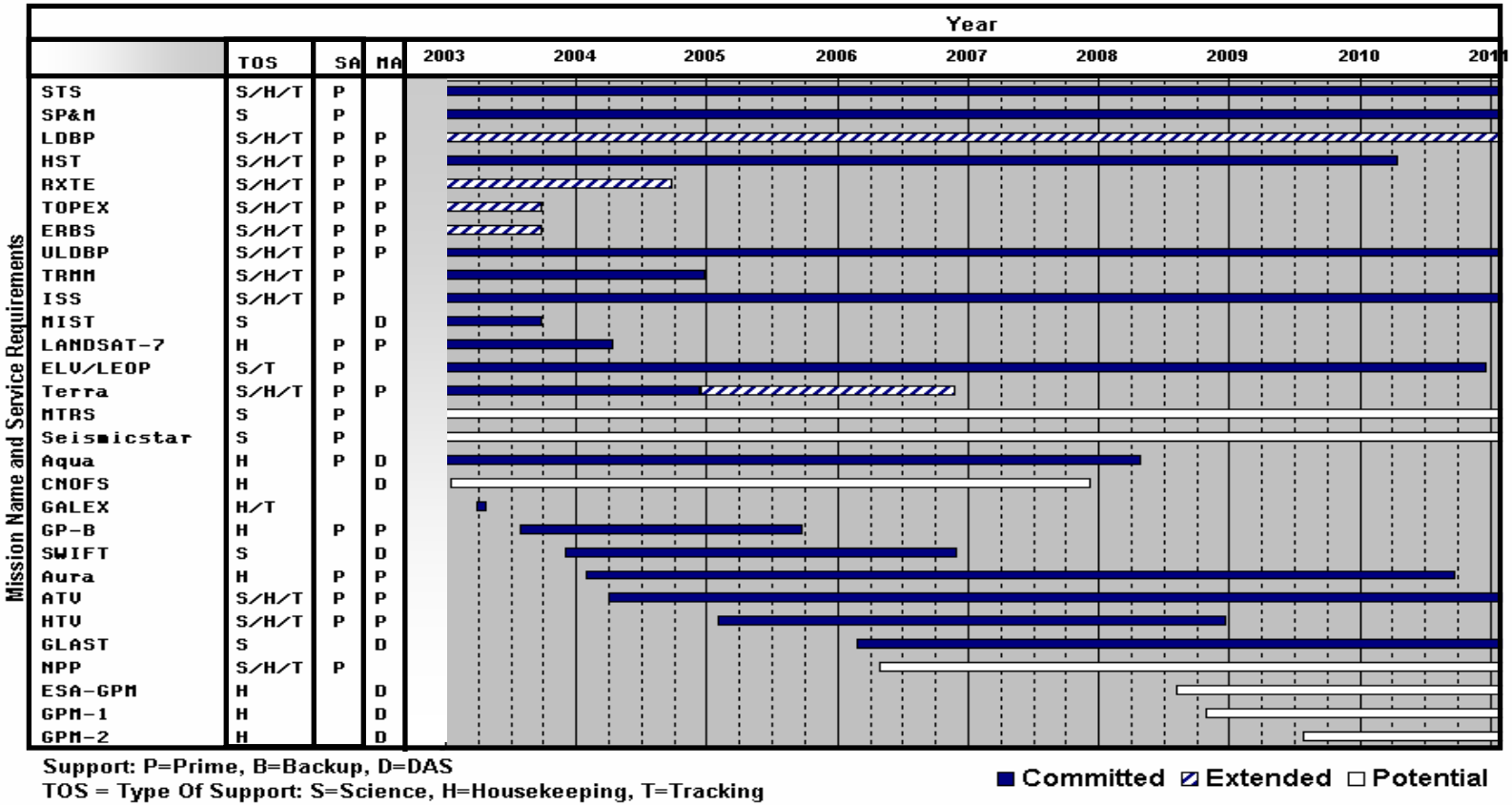
GN Mission Model (2003 through 2006)

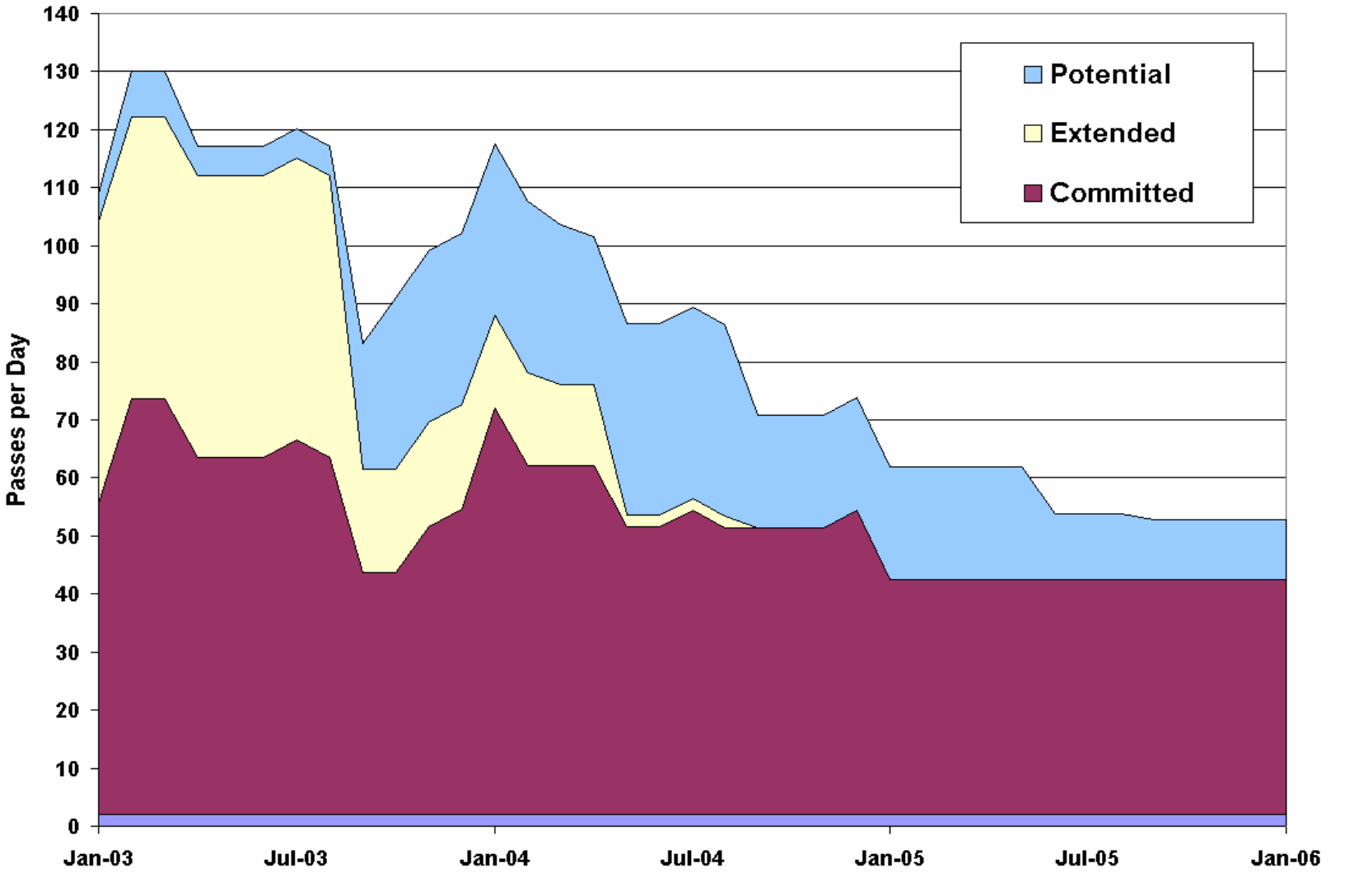


SN Mission Model (2003 through 2010)

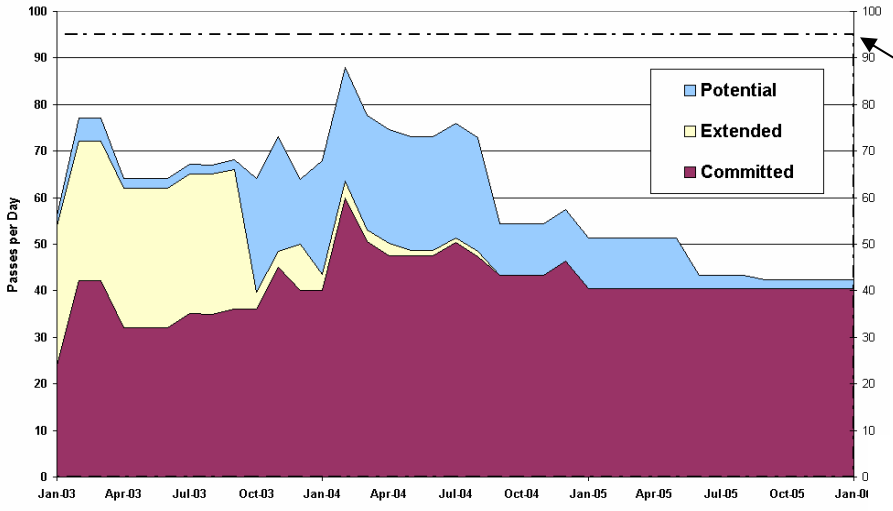


Note: ATV support runs for 6 months and off for 12 months

GN Load Forecast

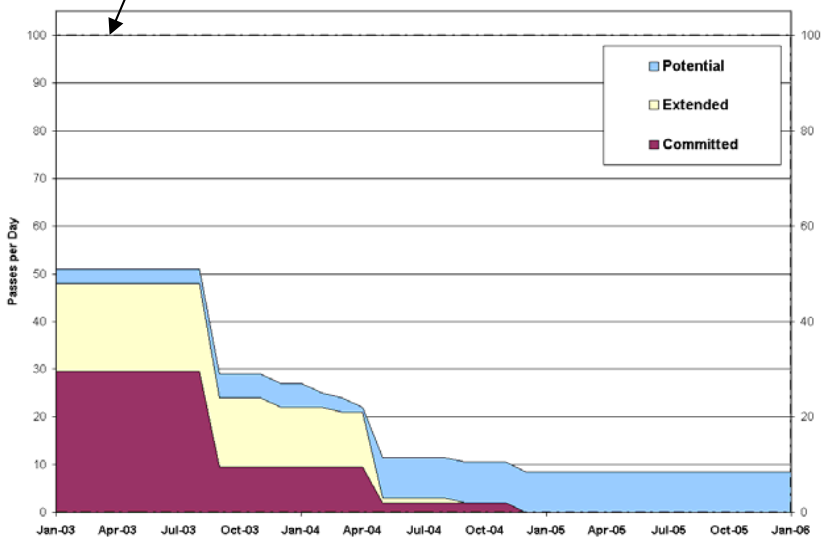


GN Antenna Load Forecasts



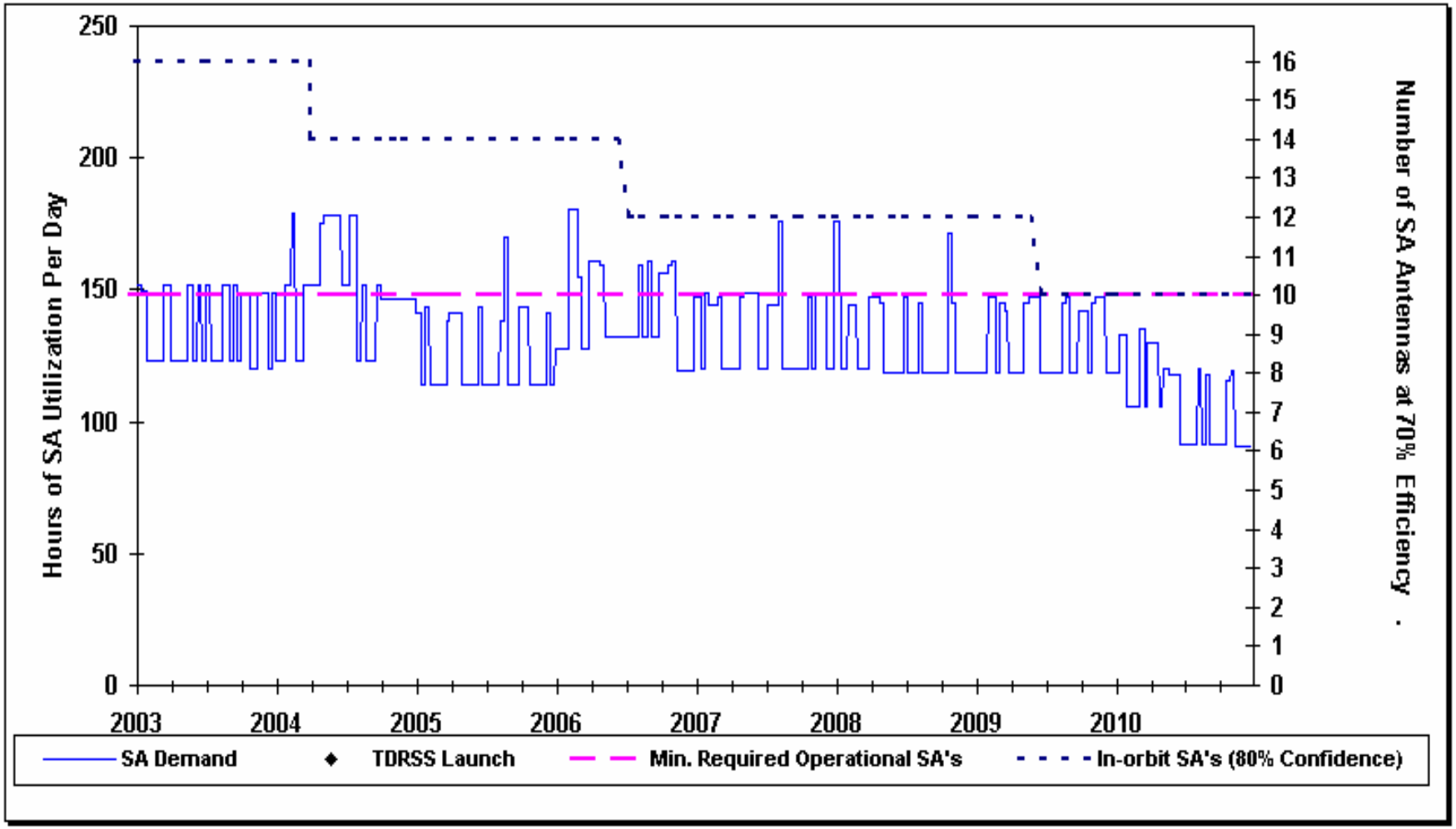
11 Meter Antennas

Maximum Utilization



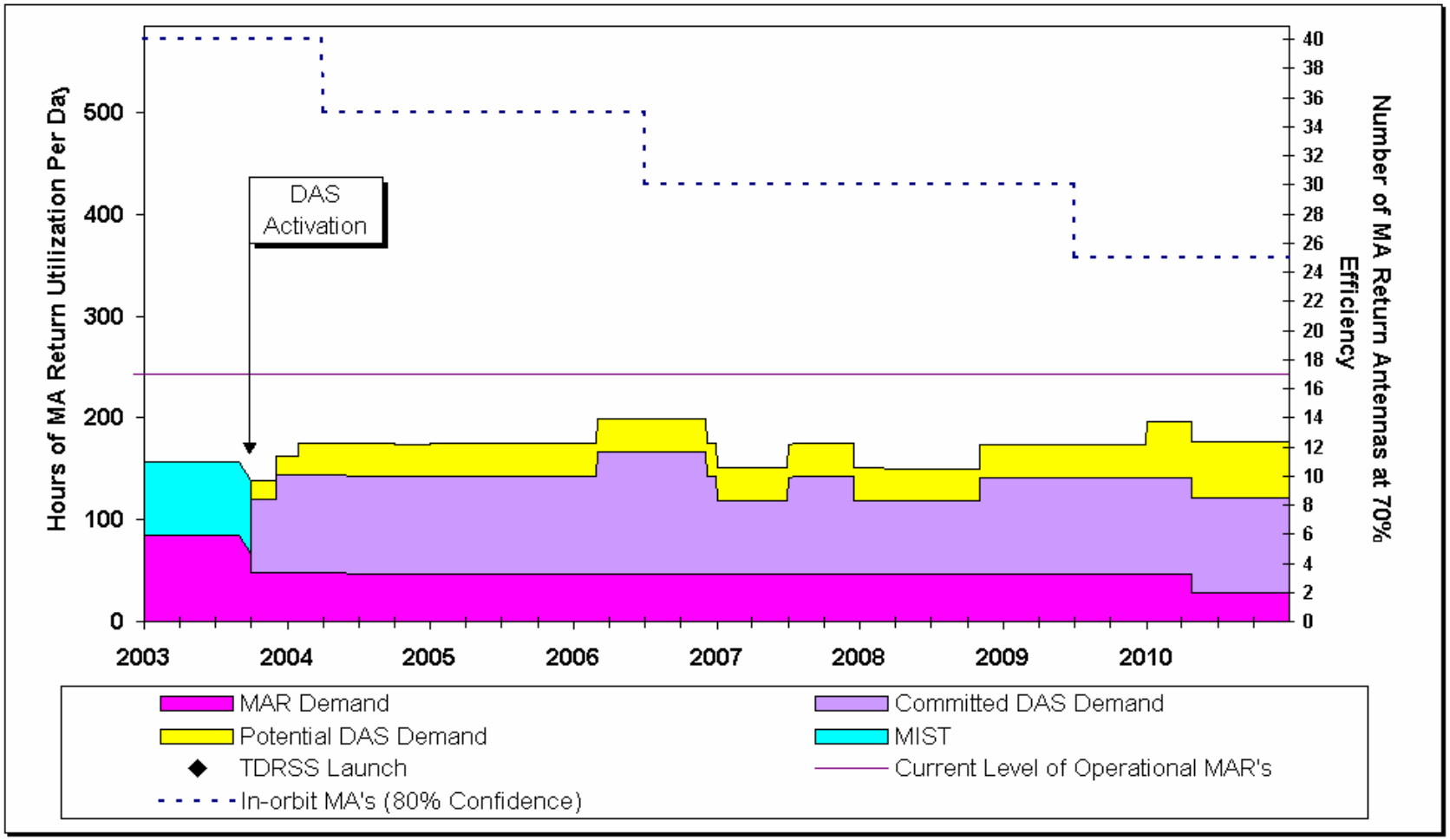
5/8 Meter Antennas

SN SA Load Forecast



Note: Minimum required operational SA's reflects 4 SA's in East Node, 4 SA's in West Node, 2 SA's in ZOE to meet the projected demand while providing needed operational balance.

SN MAR Load Forecast



Note: Current operational MAR's reflects 5 MAR's (1 TDRS) in East Node, 10 MAR's (2 TDRS's) in West Node, 2 MAR's (1 TDRS) in ZOE to meet the projected demand while providing needed operational balance.

Meeting Customer Commitments

- Both GN and SN customer support resources will be sufficient to meet current CSOC Mission Set commitments under most conditions
- There will be certain periods of time for both the GN and SN during which contention for resources will occur
  - Infrequent 11 meter antenna failures likely to produce moderate resource contention
  - Addition of third antenna at Svalbard (SG3) for backup/contingency support should help mitigate most contentions
- Better service planning continues to require more timely and complete detailed ground service requirements from the customers, including periodic updates that reflect service level changes

GN Support Impact Issues

- High priority support (launch and early operations, spacecraft emergencies, targets of opportunity, etc.) creates short periods of time where some impacts to other spacecraft nominal support requirements may be encountered
  - Tendency for critical support/LEOPs to overlap
    - e.g., ADEOS-II and GRACE-1 on Wallops 11 meter antenna
  - Upcoming GP-B early lifecycle has multiple critical support periods for on-board gyro spin-up and calibration
    - Further launch delays could push that support into the Aura LEOP timeframe
- Spacecraft extensions have helped keep overall S-Band support at high level
  - Extended QuikSCAT support (potential to 9/30/04) through upcoming Aura support period was not originally forecast

SN Support Impact Issues

- Continued increase in launch (and early orbit) support customers requesting near continuous SA link support for several hours and significant dual (simultaneous) SA support
  - Current NASA policy is to establish minimum requirements and perform assessment on case-by-case basis
    - Second SA link generally scheduled ‘as available’ NET 48 hours prior to launch
  - Customers are being encouraged to consider separate radar coverage (NASA or elsewhere) if second SA is to meet ‘tracking’ requirements, e.g., difference Doppler

Closing Remarks